The Editor of the Tropical Diseases Bulletin

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# ZANZIBAR GOVERNMENT.

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## ANNUAL REPORT

FOR THE YEAR

1912.

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# Public Health Department, Annual Report for 1912.

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# Public Health Department.

*The Medical Officer of Health to the First Minister, Zanzibar.*

ZANZIBAR,
1st May, 1913.

SIR,

I have the honour to forward to you a Report on the work of this Department for the year 1912, together with two Memoranda which form appendices.

Before submitting the details of the Departmental work, I desire to draw your attention to the following :—

*Changes in the Staff.*—To the regret of every one with whom he had come in contact, not only in his official, but also in his private capacity, Dr. A. H. Spurrier resigned his post last year. I took over charge of the Public Health Department from him on June 1st, 1912.

Mr. J. G. Parham resigned the post of Bacteriologist on October 1st, and was succeeded by Dr. A. G. Carment, M.D., B.Sc., who took charge of the Bacteriological Laboratory and assumed the duties of Assistant Medical Officer of Health.

Dr. Aders arrived in October to resume his voluntary work in Entomological and Veterinary research in the Public Health Laboratories.

In consequence of the severe outbreak of cholera, the Government secured the valuable advisory services of Dr. Milne, Principal Medical Officer, East Africa Protectorate, who arrived here in November; whilst later the advice of Dr. Spurrier was asked for, and he paid a short visit to the Island, arriving in December.

I am greatly indebted to these two gentlemen for the advice and assistance they accorded to me in somewhat troublous times.

*General.*—From the pages of this report you will, I think, agree, that the work during 1912 has been exceptionally heavy and the anxieties, due to the existence of cholera in our midst and plague and small-pox in close proximity, considerable.

In connection with good work done during the epidemic of cholera I desire specially to bring to your notice the following names :—

Dr. A. G. Carment and Dr. J. S. de Sousa. Both these officers worked with great energy, the former in charge of Mkokotoni District, and the latter in charge of Chwaka.

Inspector F. de Souza, whose services have previously been brought to the notice of the Government in connection with the epidemics of plague and small-pox. His knowledge and experience were of great value.

Sub-Inspectors R. B. de Souza, Castro and Nunes. The first was responsible for the Town, the second had very arduous work in the Mwera District, and the last named had the responsibility of finding out all that was going on in N'Gambo. All these subordinate officials carried out their duties in a praiseworthy manner.

Mr. Pandit Virigal performed the duties of death inspector with tact and care, in spite, in many instances, of considerable opposition.

I am also indebted to the Heads of Departments with whom I came in contact for the ready and prompt assistance they afforded me, and especially to the Director of Public Works, the Town Collector and Assistant Collectors, Messrs. Money, White and Turner.

The whole staff of the Public Health Department worked willingly and without complaint for long hours and in many cases at very dangerous duties.

I regret to report, that among the staff who actually came in contact with cholera, six acquired the disease, of whom four died. The names of those who suffered from cholera are :

| | | |
|---|---|---|
| *Special Gang Boys.—* | | |
| 1. | Zaidi bin Heri | ... Died. |
| 2. | Ramzan bin Ali | ... ,, |
| *Askaris.—* | | |
| 3. | Dunia bin Omari | ... Died. |
| 4. | Kinatayo bin Mabaya | ... ,, |
| 5. | Manga bin Sarbuk | ... Discharged cured. |
| 6. | Juma bin Barawa | ... ,, ,, |

These men and many of their comrades performed acts, which in other circumstances would be called acts of personal bravery, inasmuch as they each and all understood the dangerous nature of their work, but nevertheless fearlessly and conscientiously carried it out.

I have the honour to be,
Sir,
Your obedient Servant,

D. S. SKELTON, Captain.
*Royal Army Medical Corps.*
*Medical Officer of Health.*

## (1) *Vital Statistics.*

### (i) BIRTHS.

The following tables show the number, sex and nationality distribution of births in the Town of Zanzibar during the year. In parallel is given the number of births for the preceding two years, as well as the number of persons composing the various nationalities as ascertained by the last census which was made in 1910.

The number of births registered in the Town of Zanzibar during the year was 518.

| | |
|---|---|
| Males ... | 262 |
| Female ... | 234 |
| Still-born ... | 22 |
| Total ... | 518 |

Nationality of births :—

| Nationality | During. 1912 | During. 1911 | During. 1910 | Estimated population in 1910 |
|---|---|---|---|---|
| Swahilis ... | 151 | 207 | 24 | 20,285 |
| Ismaili Khojas ... | 126 | 158 | 176 | ... |
| Ithnasheri ,, ... | 30 | | | |
| Memons ... | 4 | 20 | 35 | 7,720 |
| Mohamedans ... | 2 | | | |
| Rajputs ... | 1 | ... | ... | ... |
| Banyans ... | 55 | 55 | 53 | ... |
| Washihiri ... | 27 | 29 | 6 | ... |
| Goans ... | 21 | 19 | 10 | 440 |
| Bohoras ... | 19 | 21 | 29 | * |
| Arabs ... | 17 | 23 | 21 | 3,639 |
| Manyama ... | 16 | 13 | 1 | † |
| Baluchis ... | 13 | 4 | 5 | 330 |
| Nyassa ... | 10 | 2 | ... | ¶ |
| Gazijas ... | 4 | 10 | ... | ‡ |
| Parsees ... | 4 | 8 | 7 | 183 |
| Europeans ... | 5 | 6 | 4 | 236 |
| Nubis ... | 3 | 4 | ... | 15 |
| Yao ... | ... | ... | 1 | ... |
| Myamezis ... | 3 | ... | ... | † |
| Watombatu ... | 3 | ... | ... | † |
| Barawa ... | ... | 1 | ... | 3 |
| Comoro ... | 1 | ... | 3 | 2,175 |
| Somalis ... | 1 | ... | ... | 75 |
| All others ... | 2 | ... | 1 | 163 |
| Total... | 518 | 580 | 376 | 35,264 |

* Included as Indians.
† ,, ,, Swahilis.
¶ ,, ,, All others.
‡ ,, ,, Comoro.

The total number of registered births for the whole Island of Zanzibar is as follows :—

| Districts. | 1912 | 1911 | 1910 | 1909 | Population in 1910 |
|---|---|---|---|---|---|
| Zanzibar Town ... | 518 | 580 | 378 | 247* | 35264 |
| Mkokotoni District ... | 580 | 640 | 529 | 341 | 32076 |
| Mwera District ... | 186 | 246 | 273 | 239 | 29101 |
| Chwaka District ... | 251 | 348 | 387 | 307 | 17630 |
| Total... | 1,535 | 1,814 | 1,567 | 1,134 | 114,071 |

* For the last six months of the year.

This gives an average number of births over a period of 4 years of 1,574·25 per annum. Taking the mean population to be 114,000, the birth rate is therefore 13·8 per 1,000.

Although the registration of births is compulsory by law, yet it is by no means always carried out. Still, even if it is assumed, that 50% of the births are not registered, the figure would be low.

A note on the low birth rate in the Island is included in the Appendix to this report.

## (ii) DEATHS.

The number of deaths registered during the year for the whole Island is shown in the table. For comparison the deaths for 1911 and 1910 are shown in parallel.

| Districts | 1912 | 1911 | 1910 |
|---|---|---|---|
| Zanzibar Town ... | 1284 | 1373 | 1363 |
| Mkokotoni District ... | 1118 | 1258 | 1029 |
| Mwera District ... | 1071 | 740 | 740 |
| Chwaka District ... | 782 | 459 | 402 |
| Total ... | 4,255 | 3,830 | 3,534 |

The crude death rate for whole Island is therefore 26·7 per 1,000. Had the Island not been visited by the disastrous epidemic of cholera, which accounted for some 900 deaths the year would have been a normal one. I have already alluded to the low birth rate. Now it is obvious, that if there exists a continuously low birth rate, in course of time this will operate to produce a higher and a rising death rate, for the simple fact that there will be relatively fewer young and a larger number of old persons.

Owing to the fact, that few Swahilis have any idea of their true age, I propose to leave the death rate as a crude death rate and not make any attempt to correct for age distribution

Number of deaths for the year 1912 in the Town amongst:—

| | |
|---|---|
| Males ... | 669 |
| Females ... | 615 |
| Total ... | 1,284 |

Number of deaths in:—

| | |
|---|---|
| Town proper ... | 436 |
| North and South N'Gambo Districts ... | 663 |
| Shambas near suburbs ... | 98 |
| Harbour ... | 14 |
| Walezo Leper and Poor Asylum ... | 73 |
| Total ... | 1,284 |

Table showing the nationality of the deceased in Town districts.

| | |
|---|---|
| Swahilis ... | 796 |
| Ismaili Khojas ... | 58 |
| Ithnasheri Khojas ... | 38 |
| Gazijas ... | 73 |
| Memons ... | 44 |
| Shihiris ... | 63 |
| Bohoras ... | 21 |
| Arabs ... | 50 |
| Nyassa ... | 5 |
| Persians ... | 5 |
| Parsees ... | 4 |
| Somalis ... | 10 |
| Comoro ... | 6 |
| Mohamedans ... | 26 |
| Banyans ... | 48 |
| French ... | 1 |
| British ... | 2 |
| Baluchis ... | 11 |
| Myamezis ... | 2 |
| Goans ... | 4 |
| Japanese ... | 1 |
| Pathan ... | 1 |
| Malyali ... | 1 |
| Barawa ... | 2 |
| Hindoos ... | 7 |
| Manyama ... | 1 |
| Mganda ... | 1 |
| Hajani ... | 1 |
| Suni ... | 1 |
| Kharawa ... | 1 |
| Total ... | 1,284 |

Ages of the deceased:—

| | | | | |
|---|---|---|---|---|
| Under one year | | | ... | 101 |
| 1 | to | 5 years | ... | 48 |
| 5 | ,, | 10 ,, | ... | 28 |
| 10 | ,, | 20 ,, | ... | 49 |
| 20 | ,, | 30 ,, | ... | 199 |
| 30 | ,, | 40 ,, | ... | 262 |
| 40 | ,, | 50 ,, | ... | 216 |
| 50 | ,, | 60 ,, | ... | 134 |
| 60 | ,, | 70 ,, | ... | 89 |
| 70 | ,, | 80 ,, | ... | 101 |
| 80 | ,, | 90 ,, | ... | 48 |
| Over 90 years | | | ... | 9 |
| | | Total | ... | 1,284 |

Statement showing the causes and number of deaths in Town Districts, North and South N'Gambo Districts, Shambas near Suburbs, and Harbour for the year 1912.

(*a*) *Infectious diseases*:—

| | | Males. | Females. | Total. |
|---|---|---|---|---|
| Beri-Beri | ... | 1 | ... | 1 |
| Cholera * | ... | 38 | 3 | 41 |
| Dysentery | ... | 24 | 13 | 37 |
| Erysipelas | ... | 1 | ... | 1 |
| Gonorrhoea | ... | 1 | ... | 1 |
| Gangrene | ... | 1 | 1 | 2 |
| Leprosy, Anaesthetic | ... | 6 | 7 | 13 |
| Malaria, Tertian | ... | 97 | 74 | 171 |
| Blackwater Fever | ... | 2 | ... | 2 |
| Pneumonia | ... | 23 | 13 | 36 |
| Rheumatic Fever | ... | 23 | 26 | 49 |
| Septiceamia | ... | 2 | 2 | 4 |
| Small-Pox | ... | 2 | 1 | 3 |
| Syphilis, Secondary | ... | 2 | ... | 2 |
| Tetanus | ... | 2 | ... | 2 |
| Tuberculosis | ... | 108 | 97 | 205 |

(*b*) *General diseases.*—

| | | Males. | Females. | Total. |
|---|---|---|---|---|
| Anaemia | ... | 28 | 40 | 68 |
| Diabetes | ... | 2 | 1 | 3 |
| Debility | ... | 69 | 111 | 180 |
| Rickets | ... | ... | 1 | 1 |

(*c*) *Local deseases.*—

(1) Diseases of the Nervous System.

| | | Males. | Females. | Total. |
|---|---|---|---|---|
| Meningitis | ... | 2 | 2 | 4 |
| Apoplexy | ... | 4 | ... | 4 |
| Paralysis | ... | 11 | 10 | 21 |
| Epilepsy | ... | 6 | 7 | 13 |
| Dementia | ... | 28 | 42 | 70 |
| Convulsions Infantile | ... | 25 | 18 | 43 |
| ,, Eclampsia | ... | ... | 2 | 2 |

(2) Diseases of the Circulatory System.

| | | Males. | Females. | Total. |
|---|---|---|---|---|
| Pericarditis | ... | ... | 1 | 1 |
| Endocarditis | ... | 19 | 8 | 27 |

(3) Diseases of the Respiratory System.

| | | Males. | Females. | Total. |
|---|---|---|---|---|
| Asthma | ... | 2 | 3 | 5 |
| Bronchitis | ... | 52 | 47 | 99 |
| Pleurisy | ... | ... | 1 | 1 |

---

* *Note.*—Of these, 6 deaths occurred at Gulioni Infectious Diseases Hospital among the patients that were removed from Mwera District, 4 at Walezo Poor House and 31 in Town and N'Gambo Districts.

| | Males. | Females. | Total. |
|---|---|---|---|
| (4) Diseases of the Digestive System. | | | |
| Appendicitis ... | 1 | ... | 1 |
| Enteritis ... | 2 | 1 | 3 |
| Diarrhoea ... | 41 | 54 | 95 |
| Ascites ... | 4 | 3 | 7 |
| Cirrhosis ... | 4 | 3 | 7 |
| Fistula ... | 1 | 1 | 2 |
| Hernia Strangulated ... | 3 | ... | 3 |
| Intestinal Obstruction ... | 1 | ... | 1 |
| Jaundice ... | 4 | 4 | 8 |
| Peritonitis ... | ... | 1 | 1 |
| (5) Diseases of the Lymphatic System. | | | |
| Elephantiasis ... | 2 | 1 | 3 |
| (6) Diseases of the Urinary System. | | | |
| Bright's disease ... | 6 | 3 | 9 |
| (7) Diseases of the Generative System. | | | |
| Abortion ... | ... | 1 | 1 |
| Delayed Labour ... | ... | 1 | 1 |
| (8) Diseases of the Connective Tissues. | | | |
| Abscess ... | 3 | ... | 3 |
| Cellulitis ... | ... | 1 | 1 |
| (9) Diseases of the Skin. | | | |
| Eczema ... | 1 | ... | 1 |
| (*d*) *Injuries.*— | | | |
| Burns ... | 1 | 5 | 6 |
| Drowning ... | 2 | 1 | 3 |
| Starvation ... | 10 | 3 | 13 |
| General ... | 2 | ... | 2 |
| (*e*) *Tumours.*— | | | |
| Carcinoma ... | ... | 1 | 1 |
| Total... | 669 | 615 | 1,284 |

### (iii) INFANTILE MORTALITY.

This is calculated on the birth returns.

The number of deaths under one year of age is divided by the number of births, and this figure multiplied by 1000 gives an infantile mortality figure, which is comparable year by year. Hitherto, I observe, only the actual number of deaths under one year have been recorded, whereby it is impossible to see what is going on.

The infantile mortality per 1000 births for the Town of Zazibar for the past 4 years is as follows :—

| 1912 | 1911 | 1910 | 1909 |
|---|---|---|---|
| 193 | 162 | 288 | 399 |

For comparison it may be mentioned, that the infantile death rate for England and Wales has fallen from 149 (for the decennial 1871-1880) to 127 (for 1901-1910). As to the Zanzibar figures the years, 1910 and 1909, are not I am afraid of any great value for statistical purposes. The high ratio of these years is due probably to non-notification of births, which of course raises the infantile mortality figure.

Still I am afraid that the average annual loss of infant life is somewhere between 150 and 190 per 1,000 births.

The chief causes of a high infantile mortality in the tropics are, premature birth, congenital defects, inexperience and neglect of mothers, and malaria, of which I am inclined to believe the last mentioned is the most important and next to it comes the ignorance of the mother.

A good deal of this loss of child life is preventable, and I can see few more useful lines of work than an attempt to grapple with this problem.

Very largely however it is outside a man's sphere, especially in a Mohamedan country, where the only person who can do anything in the home is a Lady Health Visitor. I understand Bombay has its Lady Health Visitors and I seriously recommend the suggestion to the Executive, that a lady should be engaged for kindred work in the Town of Zanzibar.

## (2) *Infectious Diseases.*

### (i) CHOLERA.

A summary of the cholera statistics for the year is as follows:—

| | | |
|---|---|---|
| Total cases | ... | 931 |
| Total deaths | ... | 900 |

A detailed account of the epidemic forms Appendix *B* to this report.

The total number of deaths which occurred in Town and among the prisoners from cholera, registered during the year, was 41.

Number of deaths amongst—

| | | |
|---|---|---|
| Males | ... | 38 |
| Females | ... | 3 |
| Total | ... | 41 |

Nationality of the deceased:—

| | | |
|---|---|---|
| Swahilis | ... | 36 |
| Baluchis | ... | 1 |
| Arabs | ... | 1 |
| Ithnasheri Khojas | ... | 1 |
| Gazijas | ... | 2 |
| Total | ... | 41 |

Ages of the deceased:—

| | | |
|---|---|---|
| 10 to 20 years | ... | 3 |
| 20 " 30 " | ... | 16 |
| 30 " 40 " | ... | 16 |
| 40 " 50 " | ... | 2 |
| 50 " 60 " | ... | 1 |
| 60 " 70 " | ... | 2 |
| 70 " 80 " | ... | 1 |
| Total | ... | 41 |

### (ii) SMALL-POX.

In spite of the fact, that there was during the year a severe outbreak of small-pox in a port so near as Mombasa, Zanzibar escaped very slightly.

Three factors influenced this fortunate state of affairs :—

(*a*) There exists a very large immune population in Zanzibar, a position, which is due to the severe epidemic of 1910 and also to the fact, that a high proportion of the population of the Town is protected by vaccination. The total number of persons vaccinated since the operation became compulsory is over 60,000 of whom 23,939 vere vaccinated in 1911. A well vaccinated population such as this puts us in a very strong position as regards the danger of a fresh epidemic.

(*b*) Very rigid measures were adopted against native Indian and African passengers coming from the Mainland. For instance, every native passenger was vaccinated on board the ship which brought him, unless he was provided with a certificate of recent vaccination from the Medical Officer of Health of his port of origin. Although there exists no legal power to insist on submission to vaccination on board ships in harbour, yet passengers were made to understand, that the instant they set foot on the shore they were liable to compulsory vaccination, and that there was no possibility of escape. In no case was any trouble experienced.

(*c*) Owing to the existence of cholera a very much closer supervision of all cases of illness in the town was exercised. Although it is not claimed or pretended, that the Health Office had knowledge of every thing that went on in the Town, yet I think it can be safely asserted, that comparatively little escaped the vigilance of the sub-inspectorial staff or of the police.

The system of giving a reward for notification of small-pox also is a potent factor, and is not infrequently taken advantage of. I confidently recommend that this system be continued, as I think the money is well spent.

As regards non-compliance with the law as to the notification of small-pox, certain sections of the Indian community have a dislike (which after all is only natural and can be understood) to being themselves sent, or taking their children to the Infectious Diseases Hospital at Gulioni. This is on account of two things; in the first place, they do not rely very much on European medical treatment, and secondly they are afraid of the place. I am glad however to be able to report, that these people, after their compulsory stay in the hospital, leave it quite satisfied as to both points. Again, many Indians do not regard small-pox in the same light that Europeans do. They look upon it more as we do measles, that is to say, as a sort of necessary evil, and a disease, that all children must pass through. In other words, they do not worry about it, and they consider, that interference on the part of the health authority, is sheer fussiness, and should not be encouraged.

The cases it will be seen from the subjoined table were largely imported.

| Month | Origin | No. of cases | Recovered | Died |
|---|---|---|---|---|
| February ... | Dhow from India ... | 2 | 2 | ... |
| March ... | S. S. "Præsident" from India ... | 1 | 1 | ... |
| April ... | S. S. "Palamcotta" from India ... | 1 | 1 | ... |
| May ... | Mkunazini ... | 1 | 1 | ... |
| August ... | Hurumzi, arrivals from Mombasa ... | 3 | 3 | ... |
| ,, ... | Malindi ... | 1 | 1 | ... |
| ,, ... | Shamba Tungu, arrivals from Mombasa ... | 2 | 1 | 1 |
| ,, ... | Shamba Mombasa ... | 1 | ... | 1 |
| October ... | Malindi ... | 1 | ... | 1 |
| ,, ... | Kisimajongo ... | 1 | ... | 1 |
| ,, ... | S. S. "Answald" from Madagascar ... | 6 | 5 | 1 |
| | Total ... | 20 | 15 | 5 |

Case incidence compared with former years:—

| 1912 | | | 1911 | | | 1910 | | | 1909 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cases | Recovered | Died | Cases | Recovered | Died | Cases | Recovered | Died | Cases | Recovered | Died |
| 20 | 15 | 5 | 59 | 27 | 32 | 244 | 110 | 134 | 1 | 1 | ... |

Particulars of the deceased:—

| Nationality | Vaccinated | Non-Vaccinated | Males | Females | Deaths |
|---|---|---|---|---|---|
| Wakikuyu ... | 1 | 1 | 2 | ... | 2 * |
| Somalis ... | 1 | ... | 1 | ... | 1 |
| Shihiris ... | ... | 1 | 1 | ... | 1 |
| Ismaili Khojas ... | ... | 1 | ... | 1 | 1 |
| Total ... | 2 | 3 | 4 | 1 | 5 |

* 1 case was reported after death.

Ages of the deceased:—

| | |
|---|---|
| Under one year | 1 |
| 5 to 10 ,, | 0 |
| 10 ,, 20 ,, | 2 |
| 20 ,, 30 ,, | 0 |
| 30 ,, 40 ,, | 2 |
| | 5 |

### (iii) *Vaccination.*

The Number of persons vaccinated against small-pox during the year, including 583 re-vaccinated, was 5,301.

Of these

| | | | |
|---|---|---|---|
| 3,687 | were vaccinated | | in Town. |
| 712 | ,, | ,, | in Mkokotoni. |
| 533 | ,, | ,, | in Mwera. |
| 369 | ,, | ,, | in Chwaka. |

Nationality of those vaccinated in Town:—

| | | |
|---|---|---|
| Europeans | ... | 4 |
| Indians | ... | 1,179 |
| Arabs | ... | 215 |
| Swahilis | ... | 1,781 |
| Comoros | ... | 144 |
| Washihiris | ... | 242 |
| Somalis | ... | 73 |
| Nubis | ... | 49 |
| | Total... | 3,687 |

Result of vaccination:—

| | | |
|---|---|---|
| Positive | ... | 3,067 |
| Negative | ... | 620 |
| | Total... | 3,687 |

### (iv) PLAGUE.

*Rat work in relation to Plague.*—The systematic examination of rats has been continued throughout the year in spite of Zanzibar Town and Island being plague free.

The importance of this measure cannot be over-estimated in view of the fact that we are, or have been, surrounded almost by plague-infected ports, *e. g.* Mauritius, Durban (early in 1912), Bombay, and Mombasa (late in 1912). It is hardly necessary now a days to indicate why this thorough examination is made, but it may be said, that anything like an epidemic of plague is generally preceded by an epizootic among rodents. Even as long ago as the 9th century the Bhagavat Purana referred to a mortality among rats as being a sign of the coming of plague and this seems to be the rule to-day, (an exception is that of the Glasgow epidemic of 1900, although in 1901 and 1902 plague-infected rats were found).

Without entering into detail the procedure adopted at the Health Office is as follows:—

The rats collected at various stations are brought to the office where they are labelled and killed (if not already dead) and then put into a disinfectant. A specially trained man excises the spleen. Should it appear in the slightest degree abnormal a smear is made on a slide; it is stained by Czinzinski's method and sent up to the Bacteriological Department for microscopical examination.

It is essential in order to be satisfied as to the non-existence of rat plague, that a very large number of rats should come under examination. It is not so important to record, that the town has been freed from 64,000 rats during the past year as that such a large number has been thoroughly examined. I am fortunate in being able to report, that not a single rat has been found plague-infected.

Particular attention is being paid to dhows, that have arrived from India and Mombasa. None of these vessels is allowed to proceed up the creek for the purpose of being beached without previously having been disinfected.

In connection with rats and shipping, Assistant Surgeon Creel of the United States Public Health Service has recently conducted some interesting experiments, whereby he concludes that " It is possible for rats to escape from ships anchored a quarter of a mile or even half a mile from shore and make a landing, the water being smooth and tide favourable. It is questionable whether rats under natural conditions would make the attempt, though unusual conditions aboard ship might determine this kind of emigration".

Having regard then to our infected neighbours and the possibilities referred to by Dr. Creel, it will be understood, that unceasing vigilance must be exercised, and I therefore do not recommend the Executive to contemplate any reduction in the "rat staff" or withdrawal of the rewards given to collectors.

The following figures give the details :—

(*a*) Number of rats received during the year 1912:—

| | | | |
|---|---|---|---|
| January | ... 3498 | July | ... 6432 |
| February | ... 3059 | August | ... 6500 |
| March | ... 3521 | September | ... 6726 |
| April | ... 3161 | October | ... 7605 |
| May | ... 4926 | November | ... 6277 |
| June | ... 5424 | December | ... 7317 |
| | | Total | ... 64,446 |

(*b*) Number of rats received for the past 3 years.—

| | |
|---|---|
| 1909 | ... 60,527 |
| 1910 | ... 52,136 |
| 1911 | ... 52,778 |

(*c*) Description of rats :—

| | | |
|---|---|---|
| Brown rats | (epimys norvegicus) | ... 28,293 |
| Black | (mus rattus) | ... 19,338 |
| Grey | (mus alexandrinus) | ... 13,545 |
| Musk | | ... 3,248 |
| Buku | | ... 5 |
| White | | ... 17 |
| | Total | ... 64,446 |

(*d*) Number of pregnant rats with foetuses :—

| | |
|---|---|
| Pregnant rats | ... 3,773 |
| Foetuses | ... 25,290 |

(*e*) Number of rats examined for plague 64,446

(*f*) Result of microscopical examination Negative

(*g*) Number of rats received at the various collecting stations during the year :—

| | |
|---|---|
| Mwembeladu | ... 4,344 |
| Mlandege | ... 7,297 |
| Darajani | ... 6,658 |
| Malindi | ... 2,254 |
| Health Office | ... 43,893 |
| Total | ... 64,446 |

## (v) LEPROSY.

There was an increase of 7 inmates of the Leper Asylum during the year, the figures being :—

| | Males. | Females. | Total. |
|---|---|---|---|
| 1st January, 1912 ... | 37 | 53 | 90 |
| 31st December, 1912 ... | 37 | 60 | 97 |

During the year there were—

Admissions ... 19
Deaths ... 12, (males 5 and females 7)

A certain number of lepers have during the past year caused a good deal of trouble through their unruly behaviour. Complaints have been made that they escape at night and indulge in cocoanut stealing. It is a somewhat difficult problem to know how to punish the culprits. The conditions under which the asylum is administered make it impossible to curtail their food or any privileges, such as seeing their friends, as is done in some of the large asylums in other parts of the world. We have therefore been obliged to call in the aid of the Magistrate and get them confined for a period under the charge of specially enlisted warders. This is an expensive procedure and has practically no deterrent effect whatever.

The Sisters of the Roman Catholic Mission continue to render nursing aid to the Leper Asylum and invariably carry out their voluntary labour with great devotion and skill.

With reference to leprosy in general in the Island, I regret having to record my opinion, that there is no evidence to show, that the progress of the disease is being arrested as far as this Island is concerned.

There are, I am afraid, very many lepers in the outlying shambas who remain undiscovered. This fact came to light as the result of the house to house visits, which were made during the prevalence of cholera. The difficulty in finding these cases is greatly increased owing to the fact, that, with few exceptions, villages in the real sense of the word do not exist in the Island.

Where there are collections of huts the villagers are quite ready to get rid of any one they suspect of leprosy and so we get the information, but as a rule the general rural population is apathetic.

### (vi) MALARIA.

*Anti-Malarial Work.*—The following swamps and other places found breeding anopheles larvæ were regularly kerosined during the year :—

The Ziwani Swamp
The Sebuleni Swamp
The Kiungani Swamp.
The further Kiungani Swamp by the side of Bhimjee's shamba.
The marshy ground owned by Issaji Jeewanji at Kikwajuni.
The Kikwajuni quarry ground.
The low lying land at Mwembe Tanga.
The low ground at Mtendeni on the way to the Indian Soap Factory.
The hollow ditches at Mwembeladu.
The Swamp by the side of Lady Janbai Road. (Simba Mosque).
The Gulioni Dhobi Station.
The low ground leading to Gulioni Hospital.
Mnazi Moja Golf Links and Play Ground.
Other places where rain water remained stagnant.

The following places were found breeding anopheles larvæ :—

Kiungani Swamp.
January 4th
January 15th
February 23rd
June 6th
August 18th
September 28th
November 22nd
December 30th.

Sebuleni Swamp.
January 6th
February 15th
February 28th
March 5th
March 20th
May 10th
December 3rd
December 30th.

Simba Mosque swampy part.
January 9th
January 24th
February 15th
February 28th
March 7th
March 20th
May 27th
December 3rd,

Ziwani Swamp.
April 16th.
May 17th.

Canteen Ground.
April 24th.

Golf Bunkers.
April 24th.

Mnazi Moja Water Trough.
November 16th.

Ziwani Swamp Drain at the back of the Canteen Ground.
January 6th
February 17th
March 30th
April 20th
July 17th
September 21st
September 28th
December 18th.

Banyan shamba at the back of the Canteen Ground.
May 11th
May 22nd.

Mamdoos shamba at Kikwajuni
January 6th
March 5th.

Nnazi Moja Ground.
March 30th
April 4th
May 9th
December 17th
December 28th.

Holes dug at Gulioni near the Railway embankment.
April 10th.

Mr. Rivers-Smith's Garden.
March 30th
November 11th.

Judge Murison's Garden.
April 24th

Ismailji Jeewanji's Garden.
April 24th.

Captain Barton's Garden.
May 8th.

*Mosquito Inspection Work.*—Statement showing the number of premises, etc., where mosquito breeding places were found during the year:—

| | |
|---|---|
| European Quarters ... | 19 |
| Indian „ ... | 85 |
| Arab „ ... | 56 |
| Swahili „ ... | 72 |
| Shihiri, Comoro, etc., ... | 17 |
| Ruins, compounds, gardens and grave-yards ... | 73 |
| Stables and cow-sheds ... | 21 |
| Mosques ... | 30 |
| Clubs, hotels, hospitals, godowns and other places ... | 77 |
| Total ... | 450 |

Number of premises including ruins, grave-yards and other places visited during the months of:—

| | |
|---|---|
| January ... | 740 |
| February ... | 655 |
| March ... | 929 |
| April ... | 1,940 |
| May ... | 1,804 |
| June ... | 1,657 |
| July ... | 2,311 |
| August ... | 1,582 |
| September ... | 781 |
| October ... | 1,045 |
| November ... | 573 |
| December ... | 955 |
| Total ... | 14,972 |
| Number of notices served ... | 107 |

From the above it will be seen that a great deal of work has been done in the past year in the campaign against Malarial Fever by the Mosquito Inspectors and the sub-Inspectorial staff.

In spite of their efforts, however, I regret to record the fact, that the number of deaths from Malaria remains year by year practically stationary, in that the average monthly number of deaths in 1912 was 14·2, whereas the average for the past 6 years has been about 15 per mensem.

In the first place, this is due to the apathy of the general population. Time and again house-holders have been shown breeding places of mosquitoes on their premises. No amount of persuasion will induce them to take precautions. A large and properly organised Anti-Mosquito Brigade will be formed during 1913, so as to insure a systematic and weekly inspection of all premisses and every effort will be made to obtain convictions under the Decree. An occasional fine will do more than any amount of persuasion. There exists no real reason, that I can see, to prevent the Town being, during the greater part of the year, anopheline free. This state of affairs has been brought about in many other tropical Towns, where the health authorities have had to combat difficulties as great, if not greater than we have to face in Zanzibar. In the second place, the Swamps that practically surround the Town form permanent breeding places for the anophelines, but gradually these are being drained or filled up; and if the Executive can only see its way to continue this policy, the surroundings of the Town should in the course of a few years be swamp free.

By drainage, I mean permanent drainage through concrete channels or agricultural drain pipes. Ditching and dyking I regard as being only in a very slight degree better than the swamp land. It is almost impossible to keep them at a proper level, in a few days time vegetation appears, the water stagnates or flows slowly and anopheline larvae can be found almost invariably.

However during the past year Mr. S. P. Bland of the Public Works Department has been engaged in making a comprehensive survey of the swamps near Town, and with the data now available, it will be possible to construct permanent drains which will dry the land. The work can be spread over a period of about three years. I am of opinion that, if the Government acquires the land previous to drainage, after the work has been done, the increased rental obtainable from the recovered area will repay in part the capital expenditure. At the same time, it is only right for me to testify to the value of the permanent drainage works, that have already been carried out. For instance the Ziwani Swamp, on which I understand a small boat used to ply during the rains, is now permanently dry and I am sure that the value of this work to the public health cannot be estimated in rupees. And again the new drain in the Kiungani Mission nullah has entirely done away with a fertile breeding place and is altogether a fine piece of work. In the third place, the question of wells and cesspools is intimately connected with the mosquito problem. There exists in Town a very large number of shallow wells which prove to be breeding places of mosquitoes. Sooner or later, I hope to have all the wells filled in. Apart altogether from the mosquito question, these open wells, being as they are in many instances in close proximity to cesspools, are an ever present danger as regards cholera, typhoid and other water-borne diseases. At the present time they cannot prudently be closed, because the public water supply has not yet been piped to the higher part of the Town. If all the wells were filled in, in the event of fire or a failure of the public water supply, there would be disaster, so they must remain a necessary evil. As soon, however, as the Director of Public Works has completed his water-~~spacing~~ scheme I propose taking active measures against them.

Total number of deaths from Malarial Fever registered during the year, was 171.

Number of deaths amongst :—

| | |
|---|---|
| Males | 97 |
| Females | 74 |
| Total | 171 |

Ages of the deceased :—

| | |
|---|---|
| Under one year | 6 |
| 1 to 5 years | 10 |
| 5 ,, 10 ,, | 11 |
| 10 ,, 20 ,, | 14 |
| 20 ,, 30 ,, | 32 |
| 30 ,, 40 ,, | 28 |
| 40 ,, 50 ,, | 25 |
| 50 ,, 60 ,, | 20 |
| 60 ,, 70 ,, | 21 |
| 70 ,, 80 ,, | 4 |
| Total | 171 |

Nationality of the deceased :—

| | |
|---|---|
| Swahilis | 90 |
| Shihiris | 18 |
| Ithnasheri Khojas | 6 |
| Ismaili ,, | 6 |
| Comoro | 1 |
| Somalis | 3 |
| Mahomedans | 3 |
| Banyans | 8 |
| Gazijas | 12 |
| Memons | 11 |
| Bohora | 1 |
| Barawa | 1 |
| Arabs | 4 |
| Baluchis | 4 |
| Persians | 3 |
| Total | 171 |

Number of deaths from Malarial Fever in Town since 1907.

| Months | During | | | | | |
|---|---|---|---|---|---|---|
| | 1912 | 1911 | 1910 | 1909 | 1908 | 1907 |
| January ... | 12 | 4 | 16 | 11 | 19 | 11 |
| February ... | 12 | 11 | 17 | 9 | 11 | 9 |
| March ... | 20 | 7 | 20 | 15 | 11 | 8 |
| April ... | 14 | 12 | 19 | 13 | 18 | 9 |
| May ... | 14 | 11 | 13 | 6 | 25 | 16 |
| June ... | 15 | 28 | 17 | 5 | 24 | 21 |
| July ... | 17 | 34 | 29 | 10 | 30 | 19 |
| August ... | 19 | 26 | 10 | 8 | 22 | 15 |
| September ... | 12 | 13 | 20 | 12 | 13 | 19 |
| October ... | 12 | 22 | 17 | 10 | 13 | 27 |
| November ... | 12 | 11 | 13 | 14 | 6 | 27 |
| December ... | 12 | 10 | 12 | 10 | 8 | 17 |
| Total... | 171 | 189 | 203 | 123 | 200 | 198 |
| Average per month... | 14·2 | 15·7 | 16·9 | 10·2 | 16·6 | 16·5 |

Average of means 14·9 per month.

## (vii) TUBERCULOSIS.

In July 1912 Tuberculosis Pulmonalis became a notifiable disease. Forms are sent out each month to all Medical Practitioners, requesting them to fill in the number of new cases of tuberculosis, that have come under their notice during the previous month. Should the medical man wish any steps as to disinfection of the house, etc., to be undertaken by the Public Health Department, he is asked to append the name and address of his patient.

The deaths from tuberculosis in Zanzibar during previous years have been :—

| | |
|---|---|
| 1907 ... | 176 |
| 1908 ... | 198 |
| 1909 ... | 183 |
| 1910 ... | 235 |
| 1911 ... | 216 |
| 1912 ... | 205 |

that it is to say, the deaths from tuberculosis form about one sixth of the deaths from all causes. In England, previous to the present anti-tuberculosis campaign, tuberculosis was responsible for about one ninth of the total deaths. It will thus be seen, that there is some margin to be made up, if we, in Zanzibar, can consider, that we are doing anything in the fight against the disease.

I think that for the present any idea of special hospital treatment for cases of tuberculosis is outside the sphere of practicability. I am hoping that in the near future the Bacteriological Department might undertake vaccine therapy for early cases, possibly controlled by the opsonic index, but in the present circumstances, without a trained assistant to carry on the routine work of the laboratory, this is clearly impossible.

I am hoping, when a stringent Dairy Decree comes into force, to have a better control of the milk supply, and in view of the fact, that milk is such an important agent in the dissemination of the disease, the Dairy Decree will I think have done something to justify its existence, even if it should fail in other respects.

There are no means of discovering what number of deaths in the country districts are due to tubercle, but there must be a very large number included in the native diagnosis of "kifua", a cause of death, that occurs so commonly in the shamba death reports.

The following table shows the age and sex distribution of the deceased :—

Total number of deaths from Tuberculosis registered during the year, was 205.

Number of deaths amongst :—

| | | |
|---|---|---|
| Males | ... | 108 |
| Females | ... | 97 |
| Total | ... | 205 |

Ages of the deceased :—

| | | | | | |
|---|---|---|---|---|---|
| Under one year | | | | ... | 0 |
| 1 | to | 5 | years | ... | 2 |
| 5 | ,, | 10 | ,, | ... | 6 |
| 10 | ,, | 20 | ,, | ... | 16 |
| 20 | ,, | 30 | ,, | ... | 48 |
| 30 | ,, | 40 | ,, | ... | 67 |
| 40 | ,, | 50 | ,, | ... | 36 |
| 50 | ,, | 60 | ,, | ... | 23 |
| 60 | ,, | 70 | ,, | ... | 5 |
| 70 | ,, | 80 | ,, | ... | 2 |
| | | | Total | ... | 205 |

### *(3) Prevalence of Disease in General.*

From the death returns it will be found that the diseases which claim the greatest number of victims are :—

| | | | | |
|---|---|---|---|---|
| 1. | Tuberculosis | ... | 15·9 | per cent of the total |
| 2. | Debility | ... | 14·0 | ,, ,, |
| 3. | Malaria | ... | 13·3 | ,, ,, |
| 4. | Diarrhœa and Dysentery | ... | 10·2 | ,, ,, |
| 5. | Bronchitis | ... | 7·0 | ,, ,, |
| 6. | Dementia | ... | 5·4 | ,, ,, |
| 7. | Anæmia | ... | 5·2 | ,, ,, |

I have already reported on tubercle and malaria, and of the others, Anæmia and Debility require a note. There are two great causes for both of these in the tropics, viz, Malaria and Anchylostomiasis, and in all probability the latter is the more important. Dr. Boycott in the Milroy Lectures of 1911 drew attention to the fact, that this disease may "reduce four fifths of the population to a continual state of chronic ill health, which is only terminated by their premature decease, commonly from some secondary infection".

The cause of tropical laziness and lassitude has been ascribed of late to anchylostoma infection, and in view of the constant drain on the strength of the host, together with the slow poisoning by the toxin, which the worm elaborates, it is a tenable theory. It is supposed, that infection takes place through the skin, and that the worm ultimately reaches the small gut, where after a period eggs are developed. These pass out in the stools. Boycott says that "an infected place may become infective four days after eggs have been deposited there, and may remain infective for at least a year".

There is no doubt that a very large number of natives and inhabitants of Zanzibar are infected with this parasite. The ovum is one of the commonest objects that the Bacteriologist meets with in his routine examinations.

The prevention of anchylostomiasis is a large question, but I hope, that year by year as the sanitary conditions under which people live, improve, the incidence of anchylostomiasis will diminish.

Elephantiasis in its various form is lamentably common. Although *per se* it causes few deaths, yet sufferers fall victims to intercurrent affections more readily. Dr. Forbes also in his report on Pemba calls attention to the prevalence of this disease. In 1910 there were 269 attendances for filiaral diseases at the various hospitals and dispensaries in Zanzibar. Success in the anti-mosquito campaign will reduce the incidence of this disease.

A further examination of the death returns will reveal the fact, that no cases of typhoid fever, dengue fever or Malta fever are recorded, in which we are very fortunate.

Taken as a whole Zanzibar can no longer be regarded as Burton looked upon it, that is to say as almost a death trap for Europeans. Malaria, dysentery, debility and anæmia are all preventable and can be diminished still further.

### (4) *The Poor House.*

This is practically a home for the incurable, and, as at the the Leper Asylum, nursing aid is administered by the Roman Catholic Mission under the supervision of the Medical Officer of Health.

The number of inmates was as follows:—

| | Males. | Females. | Total. |
|---|---|---|---|
| 1st January 1912 ... | 23 | 10 | 33 |
| 31st December 1912 ... | 34 | 19 | 53 |

During the year there were—

| | |
|---|---|
| Admissions | 71 |
| Deaths | 61 (males 34, females 27) |

Of the total deaths four were due to cholera.

The outbreak of this disease, as is explained in the special report, occasioned great anxiety, but fortunately it was quickly stamped out.

### (5) *Town Planning.*

I desire to draw special attention to the remarks on Zanzibar made in 1910 by Mr. A. E. Horn, Assistant Secretary to the Committee of the Tropical Research Fund.

"Opportunities which may occur through the destruction of houses by accidental conflagrations should be immediately seized to introduce improved conditions".

Such an opportunity has occurred during the past year and I am not convinced that any great use has been made of it. As regards the acquirement and subsequent demolition of makuti huts in the Shangani quarter every possible opportunity should be taken of pulling down dwellings of this description. I suggest that each year a certain sum of money should be specially voted for this service and that hut purchase in the European quarter should be made on some definite plan. In course of time I hope to see every single makuti hut in the mercantile quarter pulled down, and the inhabitants of them compelled to go and live in N'Gambo.

### (6) *Port Sanitary Service.*

The subjoined table shows the detail of vessels dealt with by the Port Medical Officers.

During the prevalence of cholera, 26 ships remained in voluntary quarantine, under which conditions no one was allowed to leave or visit the ship except embarking or disembarking passengers. This was in consequence of the very stringent regulations imposed on vessels, which did not go into quarantine, by ports further South, specially Daressalam and the ports of Portuguese East Africa.

During the year 1,263 persons were placed in quarantine on Prison Island, the majority of whom came from Mombasa, where during the latter part of the year smallpox and sporadic plague were present. Out of this number 20 were removed to Gulioni Infectious Diseases Hospital, whilst 9 died from cholera on the Island. These latter were cases who were too ill to be removed.

## PORT SANITARY SERVICE RETURN 1912.

| Months | Particulars of Steamers Arrival. | | | | | | Particulars of Dhows Arrivals. | | | | | | Total No. of Passengers | REMARKS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Steamers | Nationality | | Pratique | | No. of Passengers | No. of Dhows | Nationality | | Pratique | | No. of Passengers | | |
| | | British | Foreign | Full | Restricted | | | British | Foreign | Full | Restricted | | | |
| January ... | 26 | 13 | 13 | Full | ... | 605 | 34 | 10 | 24 | 34 | ... | 492 | 1097 | (1) The dhow arrived from India with 2 cases small-pox on board. |
| February ... | 20 | 9 | 11 | Full | ... | 191 | 47 | 14 | 33 | 46 | 1 (1) | 715 | 906 | |
| March ... | 29 | 17 | 12 | 28 | 1 (2) | 910 | 53 | 11 | 42 | 53 | ... | 630 | 1540 | (2) D. O. A. L. s.s. "President" from Bombay with one case small-pox. |
| April ... | 22 | 10 | 12 | 21 | 1 (3) | 934 | 4 | 1 | 3 | 4 | ... | 5 | 939 | |
| May ... | 27 | 14 | 13 | 27 | ... | 1378 | ... | ... | ... | ... | ... | ... | 1378 | (3) B. I. S. N. Co. s.s. "Palamcotta" from Bombay with one case small-pox. |
| June ... | 28 | 15 | 13 | 28 | ... | 1171 | ... | ... | ... | ... | ... | ... | 1171 | |
| July ... | 22 | 13 | 9 | 22 | ... | 638 | ... | ... | ... | ... | ... | ... | 638 | (4) 7 ships remained in voluntary quarantine. |
| August ... | 25 (4) | 14 | 11 | 25 | ... | 728 | ... | ... | ... | ... | ... | ... | 728 | (5) 6 do do |
| September ... | 25 (5) | 12 | 13 | 25 | ... | 521 | ... | ... | ... | ... | ... | ... | 521 | (6) 5 do do |
| October ... | 31 (6) | 16 | 15 | 30 | 1 | 627 | ... | ... | ... | ... | ... | ... | 627 | (7) 5 do do |
| November ... | 31 (7) | 16 | 15 | 31 | ... | 563 | ... | ... | ... | ... | ... | ... | 563 | (8) 3 do do |
| December ... | 25 (8) | 14 | 11 | 25 | ... | 729 | 5 | ... | 5 | 5 | ... | 8 | 737 | |
| Total ... | 311 | 163 | 148 | 308 | 3 | 8,995 | 143 | 36 | 107 | 142 | 1 | 1850 | 10,845 | |

## (7) *Routine Departmental Work.*

### (i) WELLS.

Only one well has been permanently closed during the year, others cannot be dealt with until sufficient water stand pipes for public use are available.

The wells in Town and N'Gambo districts have been constantly disinfected with Potash Permanganate.

### (ii) HOUSING.

Two thousand three hundred and twenty two visits of inspection have been paid to Indian lodging houses (gurfas, chawls).

Thirty one Indian hotels and boarding houses, 9 Indian schools, 8 aerated water and ice factories were constantly and regularly inspected. Sixty seven visits were paid to coffee shops.

### (iii) CONSERVANCY.

One thousand three hundred and four house closets have peen emptied and thoroughly cleaned out. Five hundred and seventy cesspools, etc., have been kerosined.

### (iv) RUINS AND COMPOUNDS.

| | | |
|---|---|---|
| Ruins cleaned out during the year | ... | 46 |
| Compounds cleaned out | ... | 41 |
| Total | ... | 87 |

### (v) STREET REFUSE.

Forty nine thousand one hundred and thirty loads of refuse were removed from the town during the year. The monthly average was 4,097·17 loads.

### (vi) DAIRIES AND STABLES.

Three hundred and forty one visits of inspection were made during the year.

One hundred and thirty six were ordered to be cleaned out and 18 were ordered to be provided with proper floors and drainage.

### (vii) FOOD.

The following premises, connected with the sale of food, have been regularly inspected during the year :—

| | | |
|---|---|---|
| Bake houses | ... | 21 |
| Fruit stalls | ... | 35 |
| Grocery shops | ... | 157 |
| Rice godowns | ... | 57 |
| Markets | ... | 5 |
| Drug shops | ... | 27 |

Food stuff condemned and destroyed :—

| | | |
|---|---|---|
| Bundles Bombay duck | ... | 10 |
| Bags flour | ... | 4 |
| Onions (cart loads) | ... | 22 |
| Bags garlic | ... | 6 |
| Bags potatoes | ... | 28 |
| Bags rice | ... | 154 |
| Bags mung | ... | 2 |
| Bags betel nuts | ... | 4 |
| Maize | ... | consignment. |

### (viii) NOTIFICATION.

Three hundred and fifty five notices, with a view to prosecution if not complied with, were issued as under :—

| | | |
|---|---|---|
| For repairs of drain pipes, cesspools, etc., | ... | 230 |
| For abatement of mosquito nuisances | ... | 107 |
| For removal of rubbish | ... | 2 |
| For cleaning and white-washing stables and cowsheds | ... | 6 |
| For removal of damaged and unsound food | ... | 2 |
| For white-washing and general repairs to premises | ... | 4 |
| For cleaning grave-yards | ... | 1 |
| For cleaning ruins | ... | 1 |
| For closing wells | ... | 1 |
| For proper light and ventilation to latrines | ... | 1 |
| Total | ... | 355 |

### (ix) PROSECUTIONS IN GENERAL.

(1). The Director of the Zanzibar Government Railway, for breeding mosquito larvæ in the Railway Work-shop, within 20 days of the service of a notice to abate the nuisance. Owing to the Swahili assistant to the Mosquito Inspector being confused in giving his evidence the prosecution fell through.

(2). In July Bibi Virbai, of Mlandege, N'Gambo District, was fined Rs. 40 for not abating a nuisance.

In August the following prosecutions were undertaken :—

(3). A Bohora Abdul Khader Mulla of Alibhai Jeewanji & Co., was fined for throwing rubbish on the public road.

(4). A Khoja lady, Hurbai Gulam Hoosein, for depositing rubbish on the public road. The Magistrate warned the accused and discharged her.

(5). Sundrudin Abbas, Kokoni. (6). Ismail Bau, Cutchi. (7). Adam Mussa, Kokoni. (8). Gulam Hoosein alis Mahomed Mauji, Khoja and Abdulla Rahim, Shihiri, were all charged under the Public Health Decree, No. 4 of 1909, Section 14 (1) for throwing rubbish on the public road. The Magistrate having found the accused guilty, they were fined Rs. 2, 4, 3, 3 and 2 respectively.

(9) A Baluchi Shaban bin Sadalla, was fined Rs. 5 for obstructing a sub-inspector on duty.

## *(8) Bacteriological Department.*

The routine work during the past year has been very arduous, some 1,200 special examinations of pathological materials have been made, which is a very considerable excess overthe number made in any previous year. This figure neither includes Wassermann examinations, nor the preparation of vaccines. As regards the former, Flemming's modification of Hecht's method is the technique employed. This method, being simpler than the original, has been found to give results, which are quite satisfactory, and it has the merit of being more suitable to a laboratory which is run by only one worker.

In this connection, there exists a real need for a thoroughly well trained European Head Laboratory Assistant. It is too much to expect the officer in charge to spend several hours a week, may be, making media and superintending sterilisation of apparatus, etc. It is true, that efforts have been made to find a trained man in India, Ceylon and Egypt, but the salary offered failed to attract a single applicant. The officer in charge has no time to train a local man right from the start. The only alternative I have to suggest is, that the Executive should entertain the idea of engaging a trained European, and pay him a suitable wage. I think a retired Non-Commissioned Officer from the Royal Army Medical Corps, who has had laboratory training could be found without great difficulty, and would prove a suitable man.

A knowledge of bacteriological technique is only acquired after a training which is every bit as arduous as is required for plumbing or mechanical engineering assistants.

The routine work of the Department has been so heavy, that little time has been available for research work, but a certain amount has been done and the results have been already published in association with Mr. Parham in connection with the transmission of leprosy by the bed-bug.

A Summary of this work appeared in the Review of Applied Entomology, Vol. I Ser. *B*. Part 3, March 1913, and is as follows :—

> Skelton (Capt. D. S.) and Parham (J. G.). "Leprosy and the Bed-bug".—*R.A.M.C. Journal*, xx, no. 3, March 1913, p. 291.
>
> "The authors remark that insects and biting flies have been suspected as being the carriers of the infecting agent of leprosy; *Chlorops leprae, Sarcoptes scabei, Pediculus*, mosquitos and bed-bugs have all been suggested, and they determined to see if acid-fast bacilli could be found in bed-bugs taken from the beds of lepers in the Government Asylum in Zanzibar.
>
> Sandes found acid-fast bacilli in the alimentary canals of 20 out of 75 bugs examined. Seventy-five bugs (*Cimex lectularius*) were teased out and examined, and in a second experiment one hundred further bugs were examined, one of the authors having previously systematically examined five hundred bugs in addition. The authors arrived at the conclusion that it is exceedingly improbable that the bed-bug plays any great part in the transmission of the disease in Zanzibar, as in only two films were they able to detect anything which at all corresponded with the organisms described by previous writers."

The attached table shows in detail the special work done during the year. It does not include the daily routine examinations of spleen smears to which reference is made under "Rat work".

| Months | Blood | Stools | Sputa | Urine | Scrapings | Cultural | Analysis of food stuff | Veterinary | Malaria | Blood counts | Agchylostoma | Trichocephalus | Tubercle bacilli | Pneumococci | Gonococcus | Bilharzia | Lepra bacilli | Milk | Water | Soil | Venereal | Cholera | Agglutinations | Saliva | Amobac | Police |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January ... | 2 | 8 | 4 | 7 | 1 | ... | ... | ... | ... | ... | 5 | 2 | 1 | 2 | 1 | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| February ... | ... | 11 | ... | 7 | 12 | ... | ... | ... | ... | ... | 6 | 1 | ... | ... | ... | 5 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| March ... | 5 | 8 | 8 | 8 | ... | ... | ... | ... | ... | 2 | 4 | 2 | 3 | ... | 3 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| April ... | 7 | 12 | 1 | 10 | 1 | ... | ... | ... | ... | ... | 7 | 1 | ... | ... | 6 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 |
| May ... | 2 | 15 | 4 | 6 | 6 | 1 | ... | ... | 2 | ... | 6 | 1 | ... | ... | 2 | ... | 5 | ... | ... | ... | ... | ... | ... | ... | 1 | ... |
| June ... | 71 | 5 | 9 | 9 | ... | 20 | ... | 5 | 30 | ... | ... | ... | 2 | ... | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| July ... | 41 | 6 | 11 | 8 | 1 | 8 | ... | 3 | 4 | 3 | ... | ... | 2 | ... | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| August ... | 115 | 53 | 6 | 4 | ... | ... | 4 | 1 | ... | ... | 1 | ... | 1 | ... | 1 | ... | ... | ... | 3 | 1 | 1 | 16 | 107 | ... | ... | ... |
| September ... | 3 | 7 | 4 | 3 | ... | ... | 5 | ... | ... | ... | 2 | ... | 1 | ... | 2 | ... | ... | ... | ... | ... | 1 | 1 | ... | ... | ... | ... |
| October ... | 22 | 34 | 4 | 3 | 2 | 71 | 1 | 2 | 2 | 2 | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | 12 | 7 | 1 | ... | ... |
| November ... | 11 | 27 | 5 | 2 | ... | 3 | 1 | ... | 3 | 2 | 4 | ... | 5 | ... | ... | ... | ... | 1 | ... | ... | ... | 4 | 7 | ... | ... | 1 |
| December ... | 19 | 63 | 8 | 23 | ... | 13 | 1 | ... | 2 | 4 | 26 | 6 | 2 | 3 | 15 | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... |
| Total... | 298 | 249 | 64 | 90 | 23 | 116 | 12 | 11 | 43 | 13 | 61 | 13 | 18 | 5 | 35 | 11 | 8 | 1 | 3 | 1 | 2 | 34 | 121 | 1 | 1 | 2 |

Total examinations... 1,236.

## *(9) Veterinary Department.*

During the past year this Department has come under the charge of the Health Office.

Mr. da Cunha has proceeded on leave. Mr. James of the Madras Civil Veterinary Department took over temporary charge.

The Acting Veterinary Officer reports as follows :—

*Slaughter house.*—A strict supervision has been kept over the sale of meat, and all stock has been examined at the Government Abattoir before and after slaughter.

The private abattoirs belonging to the Jamats have been also inspected at frequent intervals. Proper sanitation of the premises and compliance with the provisions of the law has been strictly enforced.

There has been gradual increase in the number of stock slaughtered compared with the previous two years. This points out the urgent need of a larger abattoir.

The following table shows the number of stock examined.—

| | Killed | Rejected | Totally condemned | Partially condemned |
|---|---|---|---|---|
| Oxen ... | 2389 | 8 | ... | 14 |
| Goats ... | 13694 | 2 | 1 | 10 |
| Camels ... | 30 | ... | ... | ... |
| Sheep ... | 1860 | 2 | 3 | 23 |
| Buffaloes ... | 2 | ... | ... | ... |
| Pig ... | 1 | ... | ... | ... |
| Total ... | 17,976 | 12 | 4 | 47 |

*Dairies.*—Two new registrations were made.

Thirty dairies and cowsheds in the town were inspected. The health of the cows was good throughout the year.

The most rigorous care was exercised to weed out tuberculous and unhealthy cows, and to protect as far as possible the health of the consumer.

The condition of the cowbyres and their general working plan continue to be entirely unsatisfactory, but strict cleanliness was imposed in every case.

It may be hoped that with the assistance of necessary legislation and in course of time, a certain amount of improvement in these conditions will be obtained.

*Stock Inspection.*—Quarantine restrictions were imposed on two occasions, and the island was sufficiently protected against the possible introduction of Rinderpest from German East Africa, where it was known to be prevailing.

Special attention is drawn to the importance of a properly equipped Segregation Shed. The site selected at Gulioni possesses all the advantages of being well adapted for the purpose.

The following table shows the number of stock imported and exported :—

| | Imported. | Exported. |
|---|---|---|
| Bullocks | 3100 | 400 |
| Cows | 318 | 77 |
| Calves | 6 | 3 |
| Sheep | 4317 | 71 |
| Goats | 13560 | 1041 |
| Horses | 7 | 3 |
| Mules | 30 | 14 |
| Donkeys | 99 | 31 |
| Camels | 74 | 1 |
| Total... | 21,511 | 1,641 |

*Veterinary Hospital.*—There has been a marked decrease in the number of cruelty cases. These have been seventy one, out of which sixty nine were discharged cured, and two destroyed as incurable.

In twenty four cases prosecutions were found necessary.

The provision of an askari attached to the work of this section, to supervise the disposal of carcases, has proved useful.

A pound has been built where all kinds of stray and outdoor animals are housed.

The following table shows the number of cruelty cases treated in the Veterinary Hospital.—

| Brought by | Horses | Donkeys | Mules | Bullocks | Camels | Total. |
|---|---|---|---|---|---|---|
| Government Inspector ... | 1 | 27 | 4 | 15 | 4 | 51 |
| Inspector Z. S. P. C. A. ... | ... | 13 | ... | ... | ... | 13 |
| Police ... | 1 | 5 | 1 | ... | ... | 7 |
| Total ... | 2 | 45 | 5 | 15 | 4 | 71 |

*Stables and Transport Department.*—Many of the horses, mules, donkeys and cattle belonging to this section received treatment for common ailments.

No horse sickness cases were noticed and there were no losses among horses to report.

*Cattle Disease.*—As elsewhere in East Africa East Coast Fever is endemic in Zanzibar.

During the year a few cases of cattle trypanosomiasis came under notice. Mr. Parham made some investigations concerning the outbreak. The strain appears to be trypanosoma pecorum. The mode of transmission is however at present obscure as no species of glossina have, in spite of very careful research, been found up to the present time on the Island. It is possible that *stomoxys* is the carrier concerned.

Dr. Aders is engaged on research work on this question at the moment. It may be said that the strain appears to be relatively avirulent.

### *(10) Entomological Research in Zanzibar.*

Dr. W. M. Aders reports as follows :—

At the instigation of Captain Skelton, I am writing a few remarks on the entomological work accomplished in Zanzibar during 1912.

Entomology used to be concerned with the study of insects solely from the biological and systematic sides ; that is entomologists were even more concerned with studying the habits of insects and with classifying them, than they were with checking and controlling them, or exploiting them as part of the world's commerce. Even to-day, the value of the economic entomologist and the part he plays in daily life is very little appreciated.

Out of all the thousands of kinds of insects which now live on the earth only a small proportion are of vital importance to man—affecting his agriculture, his cattle, his merchandise and causing or conveying disease to man on a large scale.

It is these with which we are now concerned, and it is on this account, that the economic entomologist comes to play so vital a part at the present day.

I may seem to have overdrawn the picture of the importance of the insect world, but truly, any one who has lived in the tropics will know that I have not exaggerated.

Entomology at present in Zanzibar is confined to the extermination of mosquito larvæ ; the campaign was inaugurated some years ago by the former Medical Officer of Health, Dr. Spurrier. His measures were roughly extermination of larvæ in town by means of oil, and drainage of swamps in and around the town. Owing to these measures, the health of the urban European population has considerably improved.

In the outside districts, nothing has been done, although we know that mosquitoes of all sorts abound. The natives suffer from many insect-borne diseases, notably filariasis and malaria, which may in some way account for their lethargy.

During the last year, a small species of fish has been introduced from the Seychelles. These fish are extremely predacious on mosquito larvæ, and in other parts of Africa have proved themselves to be a valuable line of defence. In my opinion these should be tried in all our permanent swamps. The Medical Officer of Health is against these measures, his chief argument being that these small fish will in all probability be destroyed by our local cat-fish.*

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* Experiments in connection with this are being carried out.

My opinion is, if they are to be of any practical use, they must be able to thrive under our local conditions without any artificial help. As far as our investigations have reached, there are no other very injurious insects to man in Zanzibar. Ornithodorus Moubata (Relapsing fever tick) and Tsetse flies have not as yet been discovered. The insects against whom a campaign should be started are the common house fly (Musca domestica), the stable fly, (Stomoxys Calcitrans and S. Nigra), the Tumbu fly (causing Myiasis in man). In my report for 1911 I pointed out means for their control.

Turning to the Veterinary Department, the most dangerous ectoparasite is the tick. The cattle of Zanzibar are not heavily infected. The three ticks implicated in spreading East Coast Fever are to be found here. Methods of eradication are being more and more studied, and dipping with arsenical washes is now everywhere being introduced in other parts of the world.

Trypanosomiasis occurs from time to time; the vector is unknown, but researches are being undertaken to elucidate this problem, and the result of my experiments will shortly be published elsewhere.

All injurious insects collected in Zanzibar have been identified through the Agency of the Imperial Bureau of Entomology, to whom my thanks are due.

A list of these was published early in 1911, since then a few more have to come to hand. An account of them will appear in the Bulletin of Entomological Research.

*Entomology in relation to Agriculture.*—Many injurious insects have been discovered, notably those of the coconut. Nothing has been done in the way of eradication. On leaving Zanzibar in 1911, I fully expected to find that some control measures would have been started before my return. This is not the case. I am given to understand, that not even the commonest insecticides and apparatus for their disposal are at hand. As long as such conditions exist, practical entomology must remain at a standstill.

The clove trees of Zanzibar seem to be free from disease caused by insects, but there are deaths among them, which at present are inexplicable. It was rumoured, that a commission was to be formed to investigate this problem. As we stand to-day, nothing is known scientifically in relation to the clove tree. As these latter are the chief source of revenue to the Protectorate, it would seem advisable to procure an expert to investigate the whole question, (as has been recently done by the Egyptian Government in regard to cotton). Scientifically, the most interesting factor is the prevalance of injurious insects on Ladies Fingers (Hibiscus Esculentus); many of these latter are identical with those injurious to cotton in other adjacent Colonies.

The scientific results of insects injurious to the economic crops of Zanzibar will appear later.

### (*11*) *Public Health Department, Pemba.*

Dr. J. Forbes, who in addition to his Medical and Surgical duties, acts as Health Officer for Pemba under the Public Health Department, forwards the following Report.—

*Preliminary Remarks.*—I took over the duties on the 1st October, relieving Dr. Freitas, the Acting Medical Officer of Health.

Pemba is an Island roughly oblong in shape with a concavity to the West. It is about 44 miles long and of a width warying from 6 miles, at its narrowest part at the centre to about 14 miles, North and South of this. It was originally entirely coralline, but, owing to volcanic action, it has been thrown up several hundred feet, especially on the West side. The eastern part is much lower and flatter. This latter is practically all coral with a small amount of soil from weathering, etc. In this locality there is good grazing and although water is not too abundant, there are some extremely good native cattle. These are the progeny of what survived from a former epidemic, which was probably East Coast Fever. Even now, the calves all get this disease, the mortality in some cases being as much as 50% but this is exceptional. This attack as usual immunises the calves. There is a distinct future for cattle breeding here under modern conditions, and this is a very important, because at present we import nearly all our slaughter stock from the Mainland, with the continual risk of also importing some of the many cattle diseases that exist there.

The East Coast is inhabited by the Wapemba, an interesting people, about whom little is really known. They are the original race of Pemba, probably coming from the Mainland before the advent of the Arabs. They are not to be confused with the Swahilis, who are the descendants of the Arabs with slave women brought over from the Mainland.

The population of the Towns, consists of Europeans, Officials, Missionaries, Goan Clerks, Arabs, Indians of different castes, Baluchis, Swahilis and negros of different races from the Mainland seeking work.

In dealing with sanitary matters all the different habits, customs and religions have to be borne in mind. Sanitary works and preventive medicine generally are confined to the Towns. As there are no records of work done before my arrival, this report for the most part refers to the last three months of the year.

The Towns have generally one or two main streets with cement drains at one or both sides, which lead to the nearest creek. These streets contain the shops and houses of the Indian traders. They are fairly well built of coral with lime plaster and roofed with corrugated iron. The poorer class and the natives have the wattle and daub style of hut with makuti thatch, which has to be renewed every two years at the outside. Practically every house has its own "choo", or cesspit, in one of the back rooms. This is simply a hole dug in the ground (it may or may not be built up) with a cement covering in which is a small opening. This is a perfect breeding place for mosquitoes. Almost every house has a bath-room, the water from which escapes by a pipe to the outside and runs away as best it can. It is not allowed to be run into the street drains.

*General Sanitation.*—The staff consists of the following:—

A Medical Officer of Health, who is also Medical Officer, serving under two separate chiefs in Zanzibar. He is stationed at Chake Chake where the chief hospital in the Island is situated. Under him and stationed in the same place is an Indian Sanitary Inspector, who periodically visits the other Towns and the shambas if any infectious case is reported.

At each Town is an assistant Sanitary Inspector who is also Vaccinator and Quarantine Officer.

At M'Koani the medical dispenser acts in these capacities.

At each Town is a staff of sweepers, varying from two at M'Koani to ten at Chake Chake and Weti.

At Jambangome there is no European Official at all, so the sweepers are under the Akida.

The sanitary work consists of cleaning the Towns from dirt and every cause of disease and attempting to keep them clean. The streets are swept twice a day and rubbish emptied into dust bins. The rubbish is removed by barrows to depositing sites, twice a day. These sites are chosen on the slopes of a ridge and the top is raked carefully and levelled. The light rubbish is burnt periodically and all tins and coconut shells collected and buried. Provided these are raked carefully to allow no rain to collect, there is no offensive smell.

The street drains are swept out every day and flushed once a week from the street taps except during the rains when flushing is unnecessary.

*Anti-Mosquito Measures.*—In all open spaces, near the houses, the vegetation is cut down about four to six times a year, by special gangs or prisoners. We have now adopted a system of pulling out the weeds by the roots and allowing grass to grow. The chief grass is a low conch on which sheep, goats and donkeys graze. Water gutters are inspected and if faults are discovered warning notices are served, and if not remedied prosecutions are carried out in all cases.

There is a system of house to house inspection to examine the drinking water which is kept in stone jars. In Chake Chake and Weti there is a water supply laid on, from which the women draw their household water in kerosine tins and store it in jars probably to cool it. They seldom pour out what remains in the jars when filling it again, hence these jars would never be clear of mosquito eggs or larvæ if there were no inspections. The Towns are divided into seven areas and one area is done every day. If a house is locked up, the Inspector returns to it the same evening or the next day.

Swamps are channelled and streams are cleared of vegetation, levelled and deepened, where necessary kerosine is used for all pools and in "choos" in houses where mosquitoes are found in water jars and also in outside cesspools.

In the officials' houses the pail system is adopted.

*Prevailing Diseases.*—The prevailing diseases are the following:—

Malaria, elephantiasis, leprosy, ulcers (chiefly of legs and feet) anchylostomiasis and jiggers.

Of these, chronic ulcers are far the commonest cause of admission into the hospitals. Other diseases are Phthisis Pulmonalis (especially amongst the Indians) small-pox and venereal diseases (chiefly Gonorrhœa). I have not seen a case of Phthisis in a Swahili for six months. The type of malarial disease is chiefly Benign Tertian. Elephantiasis is very common, various estimates putting it at 10 to 25% of the population. Leprosy is a serious menace to the Island. There are 168 lepers in the three Leper Settlements, but I am firmly convinced, that an inspection of the whole Island would reveal hundreds.

It is remarkable, that in one settlement where there are 60 cases there is only one case of tubercular leprosy. The time has arrived, when these unfortunate people should be segregated in one lazaretto, instead of the present system of three native leper villages. These villages are unfenced and unguarded and the lepers mix freely with the natives outside for trading and other purposes. The man and women are in about equal numbers, hence they pair off and live in couples. Fortunately no children have resulted up to the present. No medical treatment is or can be at present attempted on account of the distances from the Medical Officer's head quarters. It is also a very expensive method, as the transport of food to three different places costs no inconsiderable sum. There is work enough for a Doctor to look after all those people alone. It is disquieting to think, that they should be allowed to mix with other natives spreading this loathsome and incurable disease.

Venereal disease is very common, as in other parts of the East Coast. The trouble from the public health point of view is that although the men come for treatment, the women practically never do. The birth rate of the Island is falling: the registered births are only about half the number of the deaths. No place can be in a sound position economically where this obtains, and on every hand there is scarcity of labour.

*Vaccination.*—Vaccination is carried on by the assistant sanitary inspectors. No one may leave Pemba without being vaccinated unless well defined marks of previous vaccination or pitting from an attack of small-pox are seen. The vaccinators visit the shambas occasionally and vaccinate children and unvaccinated adults, but there is no regularity or system in these visits, as so much time is lost from the regular duties in Town. There is an occasional out-break of small-pox, very often of a confluent character and if so, nearly always fatal. In one case recently the skin of the whole back sloughed off. Discrete cases as a rule do well. The present refuge for six paupers should be turned into a permanent Infectious Diseases Hospital. Many of the failures of vaccination are due to bad lymph. An advance in public health would be to have lymph made in Zanzibar.

*Port Medical Service.*—The Sanitary Officer or the Assistant, visits all the steamers arriving in the ports and also all dhows, whenever we know of infectious disease in neighbouring ports. Orders are received regarding these matters from the Health Officer, Zanzibar.

*Veterinary.*—All cattle and donkeys imported are inspected by the Sanitary Officer. Slaughter cattle are imported only in small numbers at a time as they all die within a fortnight from East Coast Fever.

*Urgent Works.*—The following should be considered by the Executive:—

- *(a)* Leper Asylum.
- *(b)* Lunatic Asylum.
- *(c)* Improved water supply.
- *(d)* Improved street drainage.
- *(e)* Filling up of deep holes in streams near towns which do not run in the dry season.

*(a)* and *(b)* I have already discussed the urgent necessity for a leper asylum, and although lunatic asylums do not necessarily come under public health, I mention them here as the two might be built together and the same doctor could have charge of the two buildings. As the law stands at present, I understand, if any one is certified insane, he cannot be confined unless certified as a criminal lunatic.

They must not be detained in prison for observation.

*Improved Water Supply.*—A new well is being bored at Mkoani. At 80 feet there is a little water which is being analysed now. Jambangome urgently requires a new well.

The supply laid on at Chake Chake is plentiful, but it is taken from a point at the lowest level of the Town and it is possible that it may be contaminated by percolation from the "choos" in the huts above. It must be admitted that no disease can be traced to it up to the present. Typhoid fever is unknow,n in Pemba fortunately, but if it got in and infected the "choos" there in a serious risk of the Town's supply being infected. When the Principal Medical Officer of the East Africa Protectorate was at Chake Chake, he condemned the supply unhesitatingly.

The Weti supply is being improved at present.

*Street Drainage.*—In Chake Chake the main street drain should be continued towards the South and not allowed to cross the street at the market. Thus continued it can discharge into the creek at the back of the officials' houses.

Weti should receive special attention. The town is being greatly enlarged and the drainage should be well thought out before much more building is done.

*Filling up of Holes Retaining Water.*—Kerosining of water holes in the beds of streams which are not perennial, is a very expensive and laborious way of dealing with mosquito larvae. It would be much better and cheaper to put on prison gangs and fill up the holes and cut proper channels along the entire course for at least half a mile above their nearest point to the town. Both banks should be cleared of bush to allow proper access and inspection, then all irregularities and water should be removed, shallow places deepened, etc., as required. If it is well done the first time, the subsequent expense in keeping the stream clear is small. But however much is done, unless the deep holes are filled up, all this labour would be in vain. In Chake Chake, there is a stream running nearly parallel to the main street near the Friends' Industrial Mission. It is a typical breeding place for mosquitoes and it should be taken in hand at once.

The water hole below the Collector's house at Mkoani urgently requires filling up. The money has already been allocated and there does not appear to be any good reason for delaying this work.

*Meteorology.*—No observations have yet been made by the Collectorate Department. They have the appliances, I understand, and perhaps records may be obtained for next year's report.

*Review of Work Done.*—As the records of public health work were started on my taking over charge, it is difficult to give a review for the whole year. For this year, I content myself with enclosing a copy of the monthly report for November as an example of what we do month by month.

### *Report of the Public Health for the month of November, 1912.*

### CHAKE CHAKE.

| | | |
|---|---|---|
| Visit to houses examining for mosquito larvae | ... | 329 |
| Mosquito larvae found in houses | ... | 35 |
| Prosecution for breeding mosquito larvae (convicted) | ... | 1 |
| Notices served for breeding mosquito larvae | ... | 31 |
| Prosecution under Section 26 for concealing small-pox case (convicted) | ... | 1 |
| Notice served under Section 21 for cleaning and washing market | ... | 1 |
| Notices served for cleaning filthy yards, etc. | ... | 4 |
| Notices served for repair of drain and downspouts | ... | 1 |
| Dhows quarantined | ... | 17 |
| Passengers arrived by mail under surveillance | ... | 81 |
| Persons vaccinated during the month | ... | 316 |
| Fresh cases of small-pox admitted during the month | ... | 2 |
| Health Officer visited and inspected Weti | | |
| Sanitary Inspector visited Weti | | |
| Routine work of sweeping the streets, lanes, paths, alleys done as usual | | |
| Deaths during the month | ... | 38 |
| Births during the month | ... | 30 |

### WETI.

| | | |
|---|---|---|
| Visits to houses examining for mosquito larvae | ... | 346 |
| Mosquito larvae found in houses | ... | 22 |
| Notices served for mosquito breeding | ... | 22 |
| Prosecution for mosquito breeding (convicted) | ... | 3 |
| Dhows quarantined | ... | 34 |
| Passengers arrived by mail under surveillance | ... | 125 |
| Passengers arrived by dhows under surveillance | ... | 29 |
| Notices served for other nuisances | ... | 1 |
| Persons vaccinated during the month | ... | 308 |
| Deaths during the month | ... | 26 |
| Birth during the month | ... | 20 |
| Routine work of sweeping the streets, lanes, path, alleys done as usual. | | |

## MKOANI.

Routine work of sweeping the streets, lanes, paths, alleys done as usual.

| | |
|---|---|
| Dhows quarantined during the month ... | 42 |
| Passengers arrived by mail under surveillance ... | 164 |
| Persons vaccinated during the month ... | 89 |
| Births during the month ... | 8 |
| Deaths during the month ... | 14 |

## JAMBANGOME.

Routine work of sweeping the streets, lanes, paths, alleys, done as usual.

## (12) *Meteorology, Zanzibar Town.*

| Months | Rainfall during | | | |
|---|---|---|---|---|
| | 1912 | 1911 | 1910 | 1909 |
| January ... | 4·36 | 0·54 | 4·71 | 4·28 |
| February ... | 6·99 | 0·01 | 2·36 | 1·32 |
| March ... | 7·39 | 9·92 | 0·30 | 9·29 |
| April ... | 13·09 | 13·40 | 14·52 | 26·80 |
| May ... | 3·45 | 17·51 | 11·77 | 4·56 |
| June ... | 0·47 | 2·24 | 0·02 | 0·19 |
| July ... | 0·03 | 1·53 | 3·30 | 2·72 |
| August ... | 1·04 | 1·76 | 1·82 | 3·11 |
| September ... | 6·59 | 1·22 | 0·67 | 2·51 |
| October ... | 0·98 | 2·89 | 1·81 | 6·85 |
| November ... | 5·70 | 6·26 | 7·47 | 10·75 |
| December ... | 17·82 | 1·86 | 8·08 | 12·76 |
| Total ... | 67·91 | 59·14 | 56·83 | 85·14 |

## APPENDIX A.

### *The Birth Rate in Zanzibar.*

It seems to be agreed, that one of the disturbing elements in the economic future of the Islands of Zanzibar and Pemba is the low and even falling birth rate.

The purpose of this memorandum is to show (1) how low this rate is, and to what extent the rate is falling; (2) to examine into the causes of this phenomenon; and (3) to suggest and ask for suggestions as to how this may be arrested.

(*1*) *Historical.*—It may be mentioned that this is no new question. Mr. Cave gave the matter his attention in his Report for 1908. He mentioned in that report, that owing to a severe outbreak of small-pox in 1889 there was a scarcity of children of the ages 8-18. He meant no doubt, that the age and sex distribution, 8-18, was out of proportion to the remainder of living persons. He noticed that tuberculosis was common; but tubercular parents are by no means the most sterile element in a population.

He found there was a disinclination on the part of young married women to have children and he ascribed this disinclination to causes that have been laid to the charge of English and French mothers, *viz.*, that child-bearing interferes with a social and gay life. Finally he adds, that the native practices of procuring abortion and long continued suckling must be taken into consideration. I am obliged to traverse this last contention.

It is said that the Japanese women suckle their children for three years, and yet the population does not suffer in numbers. There is no physiological foundation for the statement that lactation interferes with ovulation. I gather Mr. Cave thought the principal cause was an influx into Town of newly freed slaves and a subsequent loss of a sense of moral responsibility. With the exception of endeavouring to persuade the shamba folk to remain in the shambas he does not appear to have had any remedy to suggest.

The Islands of Zanzibar and Pemba I may add are not exceptional in being face to face with this problem, for, apart altogether from European and American economics, German East Africa I am informed is in a similar predicament†—whilst it is notorious that Uganda at the present moment is very behindhand with its population. But the cause of Uganda's trouble is well known, as here an enormous percentage of the population has suffered, or still is suffering from syphilis, a disease introduced and spread as the direct result of the breakdown of tribal customs consequent on the introduction of civilisation!

(*2*).—I propose analysing the Births and Deaths Returns for the years 1910, 1911 and 1912 only, for although returns for earlier years do exist, yet I do not think they are of any great statistical value.

I have tabularised the years under examination as follows :—

| Districts | Births during | | | Deaths during | | |
|---|---|---|---|---|---|---|
| | 1910 | 1911 | 1912 | 1910 | 1911 | 1912 |
| Zanzibar Town ... | 378 | 580 | 518 | 1363 | 1373 | 1284 |
| Mkokotoni ... | 529 | 640 | 580 | 1029 | 1258 | 1118 |
| Mwera ... | 273 | 246 | 186 | 740 | 740 | 1070 |
| Chwaka ... | 387 | 348 | 251 | 402 | 459 | 706 |
| Chake Chake ... | 267 | 306 | 351 | 411 | 398 | 495 |
| Weti ... | 121 | 100 | 895* | 447 | 459 | 357 |
| Mkoani ... | 214 | 126 | 146 | 219 | 198 | 161 |
| Total ... | 2,169 | 2,346 | 2,927 | 4,611 | 4,885 | 5,191 |

* Registration suddenly enforced.

This table shows an apparently alarming state of affairs. In three years twice as many people have died as have been born. In other words, in about 80 years from now Zanzibar should be depopulated, if things continue in the same way.

During these three years we have had no really serious epidemic of disease except cholera, but reference will be made to this factor later.

(*3*). The next point to consider is, is the death rate abnormally high, thus making the birth rate appear relatively low?

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† It may be noted that attention has recently been drawn to the falling population in the Marshall Islands in Melanesia, one of the causes of which is said to be this same absence of a sense of moral responsibility.

Now 14,687 deaths in 3 years is 4,895 per annum. Assuming the population of both Islands to be about 200,000, that gives an average crude annual death rate of about 24 per 1,000. This is a very fair death rate; it is about 10 per 1,000 higher than the death rate for England and Wales, and it compares favourably with the death rates of other British Tropical Dependencies.*

The birth rate works out at 12 per thousand for both Islands and that compares very badly *e. g.* with Ceylon, where it is 35 per 1,000 and even with England and Wales where it is 23·8 per 1,000.

(*4*). In the Island of Zanzibar all districts show a fall as compared with the preceding year, but in Pemba all show a slight rise.

This however I think is due to registration having been insisted on more strictly this past year in Pemba.

*The Causes.*

As to what these are, a great deal must of necessity be left to speculation, but I should divide them into (*a*) Medical and (*b*) Ethical.

The former is further sub-divided into :—

(i).—*Venereal disease in early youth.*—In going over the medical history sheets of boys attending the Government School, I found that 3% out of 400 examined had suffered or were actually suffering from gonorrhœa or some other venereal disease at the time of the examination.

If 3% of a large collection of school boys actually have venereal disease, one gets an index of what an amount of venereal disease must exist amongst the general population.

Gonorrhœa for instance in the case of a child, whether boy or girl, will surely lead to sterility, if to no more, especially when it is considered, that the disease would get no treatment at all worthy of the name.

Among adults venereal disease is extremely common.

(ii) *Early Marriage.*—I understand the marriage age of girls is from 8 or 9 years of age and upwards.

This early age must have a disastrous effect on the child bearing capacity of the parent. In India of course child marriage among Hindus is still the rule, though it is becoming less so but the couple do not co-habit until early adolescence, certainly not as children.

(iii) *Malaria.*—A recent paper on the influence of malaria on the birth rate caused me to investigate this question. One can understand that in the case of severe epidemics of malaria such as some times occur in the Punjab, that the birth rate would decline simply owing to there being fewer women of a child-bearing age.

I have therefore prepared the attached table. I have taken the average birth-rate for Zanzibar Town for the 3 years 1910, 1911 and 1912 and also the malarial death rate for the years 1909, 1910 and 1911. The triple line (see table opposite) shows the birth rate, the double the malarial death rate.

If the month of January is correlated to the preceding April *i. e.*, 9 months earlier, the result is inconclusive. But, if the correlation is made for 10 months and not 9, then there is some slight evidence that a relatively high malarial death rate does correspond 10 months later with a low birth rate. This is shown in the dotted line.

But the net result is, that malaria in Zanzibar has a comparatively small effect on the birth rate.

(iv) *Filiariasis.*—This disease leading in some cases to lymph-scrotum is said to have an effect which may be either mechanical or organic. Common though filiariasis is, and it is one of the commonest diseases in the Island, yet the number of cases of elephantiasis of the scrotum is I think too small to make any impression.

(v) *Epidemic Disease.*—In 1905 there was a severe outbreak of plague which accounted for 154 cases with 123 deaths. There was no registration of births in 1906 in Town, so the influence of this epidemic cannot be estimated. In 1910 there was a severe epidemic of small-pox, accounting for 244 cases with 134 deaths, but the total number of births in Town in 1911 was 380 against 378† for 1910, and there was no epidemic in 1909 at all.

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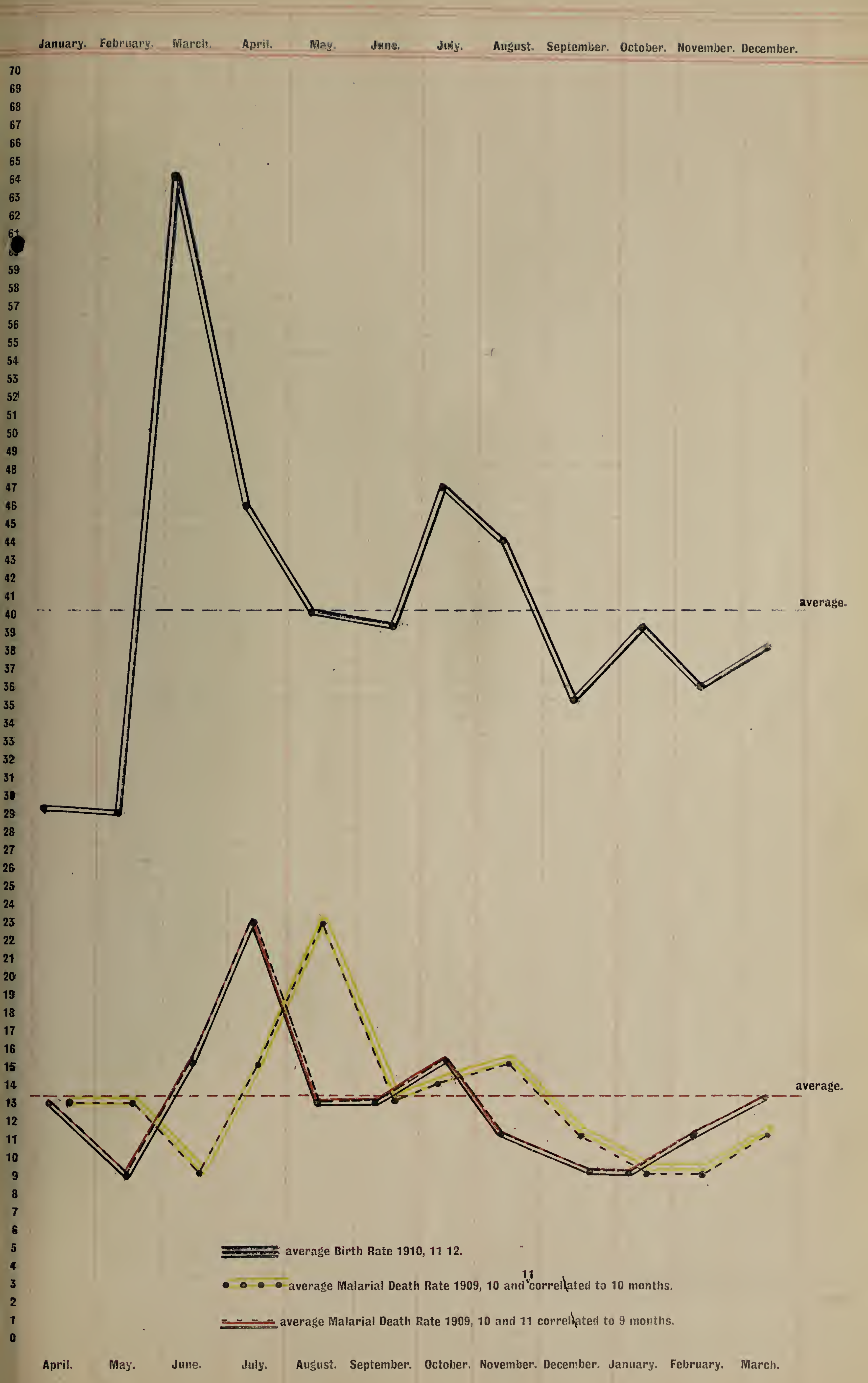
* The death rate in Calcutta is about 31 per 1,000.

† A reference to the table under vital statistics—Births, shows that Swahili births were in number almost negligible.



Litho, Leader, Nairobi & Mombasa.

There was however a drop of about 30 in the number of births in the Mwera District in 1911.

In short, such epidemics as we have had, with the exception of that of cholera in 1912, do not appear to have had any marked influence at all.

The effect of cholera will not be apparent until June or July of 1913.

(vi) *The Production of Abortion.*—A great deal is heard of this practice, and although I have not been long enough in the Island to speak with great authorithy on the matter, yet my present opinion is, that it is nothing like so common a practice as it is supposed to be. In the first place, I have failed to discover the marvellous abortifacient, that is so much talked of. It is true, I admit, that many Swahili women chew seeds and leaves of *carica papaya* in order to restore menstruation, but there is no alkaloid in this which has emmenagogue properties. Gunpowder is also swallowed—this might produce such vomiting as would bring on an abortion. But the common practice is for the pregnant woman to go to a wizard, who gives her a piece of paper with a charm written on it. This she swallows, and naturally there is no effect.

I am however keeping a careful lookout for native drugs that can produce abortion, and as soon as I get any I shall have them analysed.

But even in Europe it is an exceedingly difficult and in many cases an impossible thing to bring about an abortion by the use of drugs.

The drugs commonly used among Indians are garlic and the juice of the euphorbium, arsenic, plumbago zeylanica, calotropis gigantea, capsicum seeds, oleander, bamboo and any number of other roots. The mere fact of there being such a number of abortifacients shows how unreliable they are. Plumbago zeylanica (chitrak in Hindustani) is called the "Abortion Stick". It is applied to the *cervix uteri* as a paste or can be given in pills.

I doubt very much whether instrumental means are common. It is exceedingly unlikely that the victim would survive after undergoing such unskilled treatment as she would get from a native wise woman.

(*b*) *Ethical Considerations.*—These must necessarily be largely speculative. Whether it is the honest wish of the Swahili and Arab married women to be childless I do not know. From such enquiries as I have made I do not think it is. Mr. Cave lays stress on the love of gaiety and dancing and ngomas as being a factor making women unwilling to bear children[*]. But I find the childless village as well as the childless Town. If one goes into the shambas, and if one can find a collection of huts such as at Chaani or at Marseilles sufficient to justify the name of village and then asks for the children to be produced for inspection, there are not any to produce in any number. Here and there a mother can show one. During the cholera epidemic I had occasion to quarantine large collections of people, and having gained their confidence, have asked those women who have got children to put up their hands. Only a few did so. In fact Zanzibar seems to be becoming a childless Island.

(*c*) *Remedies.*—I have none to suggest. We may hope for better registration when the general population understands that notification does not mean immediate imprisonment or increased taxation, and with an increase in the number of births registered we may imagine that the birth rate is rising.

If in this state of affairs, there is any curious psychological factor dependant on a slave race suddenly becoming free this will right itself in time, but we should have seen some sign of it by now, and I think it has not been a factor operating among freed slaves in America, the West Indies or on the West Coast of Africa. If, on the other hand, the Swahili, as a Swahili race, is a dying one, like the Australian aborigine, the Maori and the Red Indian, then nothing can stop it. It would appear that the race has got to go.

As to how to make the registration of births more accurate and more complete, I am afraid my knowledge of the country hardly warrants my hazarding a suggestion. In Zanzibar Town I think the percentage of non-notification is comparatively small, say under 10%.

In India it has been found necessary to offer a small reward to the professional gossips—such as barbers, midwives, pariawallas and such like. Whether that system could be applied to the shamba districts I do not know. But I think that the Masheha could be made to understand, that if a birth is discovered in their districts, which has not been notified, that they, as well as the parents, will be dealt with. The local Sheha should be fined and the parent can be prosecuted at law.

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[*] An intelligent Swahili on being questioned on this subject ascribed the childless condition of the Coast Towns being simply due to farm yard morality of the inhabitants.

## Appendix B.

### *Report on the outbreak of Cholera in Zanzibar in 1912.*

*Introduction.*—It is a little difficult, in order to give a clear view of the epidemic, to know where to begin. If a strict chronological order is adhered to, it would be necessary to go back to cases earlier in the year—to cases, which only in the light of later experience may be looked upon as possible cases of cholera.

It seems the best plan would be to deal with the recognised cases, tracing from the outbreak in the jail, the march of the disease, and reverting where it may seem necessary, to suspicious cases which have occured earlier. The full value of these early and at the time unsuspected and unrecognised cases, will be appreciated in the section dealing with the theories of the origin of the epidemic.

*Historical Note.*—All those best qualified to judge appear to be agreed on the point that for 40 years approximately recognised cholera has been absent from Zanzibar Islands.

The actual details of the epidemic of 1869/70 are to be found in Dr. J. Christie's work "Cholera Epidemics in East Africa."

Dr. Christie was physician to H. H. the Sultan and had exceptional opportunities for describing the disease as it occurred in Zanzibar. It appears, that about the middle of October 1869, news reached Pangani of an epidemic disease in the interior, that immense numbers of Masai had died and that the disease was approaching the Coast. At the end of October cholera had reached Pangani by extension along the Harush caravan route from the Masai country. The next step was, that a Pagani dhow touched at Mangapwani and landed some passengers and a death from cholera occurred next day. Cholera then broke out in Malindi.

The 1912 epidemic was true to the type of 1869, because one reads of natives suddenly taken ill staggering home to die, others dropped down in the streets and died there.

Dr. Christie thought the reports exaggerated and ascribed death to heat apoplexy or sun stroke. He did not actually see a case until near the end of November. His description of the case is very graphic, and reading it, takes one, who has been through a cholera epidemic, back again through those dreadful times. Towards the end of November there was neither house nor hut into which death had not entered, and the mortality in Malindi was dreadful, and the entire district was casting out its dead. It would be difficult, the author goes on to say, to describe the state of the city without laying oneself open to suspicion of exaggeration, the sights were dreadful, it was as if the city was beleaguered and the inhabitants were falling daily under the rifles of an unseen foe. There was no panic, but a gloom settled over the city. All business was suspended and nearly all the shops were closed. The sole occupation of the living consisted in attending to the sick and burying the dead.

As might be expected, and, as happend in 1912, the pestilence was not confined to the Town. It got to Mkokotoni early and in December 1869 and January 1870 it was reported to be raging in every part of the Island.

The end of the epidemic of 40 years ago was the same as that of last year. It died away—it reappeared and died away again.

The number of deaths in the city and suburbs must have ranged, says Dr. Christie, between 10,000 to 15,000. The former number he regards as the lowest possible. Throughout the entire Island the probable mortality was between 25,000 and 30,000. Nineteen Europeans and Americans died but they were all ship people and not residents.

Dr. Christie's theory of the march of the disease is, that it came from Jeddah, starting in 1865. Thence it travelled slowly but steadily through Abyssinia, Somaliland, through the Kikuyu and Masai country to the Victoria Nyansa. It was near Harrar in 1867, in Jubaland in 1868, on the Lake in 1869. It was on Tanganyka in 1870 and so all along the great Central African caravan routes. These are definite facts.

The 1865 epidemic was by no means the first to visit the Island of Zanzibar, nor, on account of the extent of its trade and communication with India for centuries, is there any reason to suppose that this would be the case. There is reason to suppose, that cholera was epidemic in Zanzibar in 1821, for a slave dhow from Zanzibar was captured in that year with cholera on board.

There was another epidemic in 1836 and 1837. Dr. Christie is my authority for these statements. He interviewed natives who in 1870 remembered them, just as I have met many people, who have a good recollection of what happened in 1870. From 1837 to 1858 the East Coast of Africa was free from cholera, though it is by no means sure that Central Africa was. Speke refers to cholera in Central Africa in his Discovery of the Source of the Nile. In 1858 cholera as usual appeared at Mecca. It spread of course to Massowah, Berbera and Aden, thence to Muscat. The rest is easy to follow. In these circumstances it would be almost impossible for the East Coast of Africa to escape.

In those days the dominions of the Sultan of Zanzibar extended from Guardafui to Delgado, and Arab garrisons were maintained on the Somali Coast. Burton describes the "terrible ravages" of the cholera epidemic which raged in Zanzibar in 1859. In fact, part of Burton's exploratory work had to be postponed on account of cholera.

Burton says, that although he was familiar with cholera in Italy, India and Scinde he had never seen such ravages as it committed at Kilwa. General Rigby, the Agent and Consul General in Zanzibar at that time states, that many of the Coast towns were almost decimated. He estimates the mortality in the town at 7,000 or 8,000 and in the whole Island at 20,000.

I have quoted from Dr. Christie's very valuable and exceedingly interesting work at some length in connection with the two previous epidemics, because one sees how similar all three epidemics have been in many respects. Modern science however stayed the death roll in 1912 at less that 1,000 compared with 25,000 in 1869 and 20,000 in 1858. Cholera it is probable, will come again some day or other, but with the experience we have acquired we can only hope, that the disease will call for but passing comment as, in the light of our modern knowledge, the mortality will be small. That must remain our hope.

## CHAPTER I.—CHOLERA IN THE JAIL.

On the morning of August 7th, I received a letter from the Principal Medical Officer asking me to be present at a *post mortem* on a prisoner who had died in the hospital. This death was the third that had occurred within two days. From the history I got, I suspected poison of some sort, so I had the stomach carefully sewn up and directed that it should be sent to the laboratory. Passing along the corridor, I happened to look in at the prisoner's ward which was very full, and I found a nurse massaging a patient. She informed me that he had muscular cramps and that others lying near had complained of similar symptoms. One glance at the stool, which was shown me was sufficient to arouse my suspicions. A stained smear was made within a few minutes and the result was to find practically nothing but a vibrio organism present on the slide.

A flake from the stool was inoculated into peptone salt. Examination of the stomach referred to above showed the presence of morphologically similar vibrios.

This finding was at once communicated to Dr. MacDonald, who came to the laboratory to see the slides.

Steps were at once taken to visit the prison and cut off the water supply. Samples of water were taken from the stand pipe in the jail. The prison water was derived from the Town main and could not be contaminated in the jail

Bacteoriological examination has shown that this water is a fairly pure water as regards its coli contents, and on this occasion no sign of a vibrio was observed after culture by the "Enrichment" method in the usual way.

At this stage of the outbreak there was no time to start investigating the why and the wherefore of the epidemic—all our energies were devoted to trying to check it.

The drinking water for the prisoners was now boiled in large sufurias under my personal supervision and those cells in which the sufferers had slept were disinfected.

It was decided on my recommendation that the prison should be evacuated and all prisoners removed to Quarantine Island. This was carried out on the 9th August, everybody who had had anything to do with the jail being ordered to proceed to the Island and stay there in rigid quarantine until further orders.

The following table shows the incidence of the disease among the prisoners.—

| August 1912 | Admissions | Deaths |
|---|---|---|
| 5 | 2 | ... |
| 7 | 6 | 3 |
| 8 | 4 | 1 |
| 9 | 10 | 3 |
| 10 | 9 | 3 |
| 11 | 1 | 5 |
| 12 | 2 | 1 |
| 13 | 1 | 1 |
| 15 | 2 | 3 |
| 17 | 1 | ... |
| 18 | 1 | ... |
| 19 | 1 | 1 |
| 21 | 1 | ... |
| 30 | 1 | 1 |
| Total ... | 42 | 22 |

Mortality 54·7%

From this table it will be seen that between August 5th and August 10th no fewer than 31 cases of cholera were admitted to Hospital out of a total of 42.

Now (I) Where did the infection come from?
(II) How did it get into the jail?
(III) Why did the infection die down after removal to Prison Island?
(IV) And why did it not suddenly cease on say the 14th or 15th?

(I) The infection did not come from the main water supply, otherwise practically every prisoner in the jail on August 5th would have been attacked. The strength of prisoners in jail at that time was about 115. The prison used the same water supply that the rest of the Town was supplied with and no cases of spontaneous cholera were known to exist in Town. Bacteriologically, the prison and Town water supply was safe. I found however that in each cell a supply of water was put at night and stored in an open drum. Also in certain cells extra drums were provided for water for ablution purposes after the prisoners had been to the latrine. These ablutions are of course done by the hands which are dipped in the drum.

It was a matter of indifference to the prisoner which drum he drew his drinking water from. In any case it is readily conceivable how if one drum become contaminated, the others could be infected with the virus.

As soon as the prisoners arrived at Prison Island water was stored in pad-locked drums fitted with a tap—no matter whether the water was for ablution or drinking purposes. But even this precaution did not stop the disease entirely. I then adopted the plan of making each man wash his hands in a strong solution of carbolic after he had been to the latrine. As a warder accompanies a prisoner on these occasions it was made a matter of discipline that the warder should see this order carried out. Further every prisoner before being given his food was compelled to wash his hands in a large sufuria of strong carbolic.

These extra washing precautions were only brought into force on 21st and the effect became apparent, because between August 21st and August 30th there were no further cases of cholera.

I have recently learnt that in an epidemic of cholera in a jail in Manilla the authorities were unable to stamp it out until these washing precautions were adopted.* This is an interesting fact.

How the case, that was admitted to Hospital on August 30th, *i. e.*, nine days after the last case, became infected is a mystery to me.

However this was the last case and by September 14th. I considered that the prison outbreak had been stamped out.

(II) How the infection got into the jail will probably always remain a speculation.

It was not brought by the Indian warders, because bacteriological and serological tests were carried out on them and proved negative, and only one—the Jemadar—had been in India during the previous year. The Jemadar had been in India the previous September but as far as we can say he was not a carrier.

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* Military Surgeon 1912.

One may suppose therefore, one must in fact conclude, that it was brought in by a prisoner who had contracted the disease in the shambas of the Island. This man I cannot trace.

There is only one other point to note about the outbreak in the jail, and that is that on August 5th a prisoner was discharged "Sentence-expired". This man was found in the road early on the morning of August 10th. He was carried to Gulioni Hospital and died there of cholera the same day.

Did that man take cholera with him out of the jail or did he contract it in the shambas? His real movements were never traced though constant efforts were made.

My own opinion is that this man did not get cholera in the jail—he got it in the shambas after his discharge. In other words he was not the source of infection to the whole Island—but he was a victim of unfortunate circumstances, in that he stayed in some place where the disease was just starting, though I did not know it at the time.

Questions (III) and (IV) are I think answered in the reply to (I).

The mortality 54·7 per cent is about the usual one at the start of an epidemic where hospital treatment is available and at hand.

### *Anti-cholera orders at Quarantine Island.*

1. All wearing apparel of all prisoners, warders, askaris, cooks, cooks' boys and of the jemadars is to be thoroughly washed, dried and disinfected with as little dalay as possible.
2. All sleeping mats to be disinfected twice a week at least.
3. No food shall be handled after being cooked except by the feeder.
4. All plates, spoons, ladles, cooking pots to be boiled for five minutes before and after use.
5. All prisoners to be served with their food on their mats outside in the courtyard and not on the bare floor.
6. All prisoners to wash their hands with the carbolic lotion provided before and after meals.
7. All prisoners to wash their hands in a solution of carbolic after going to the choo.
8. The prisoners to be broken up into batches, entirely separate one from the other, with separate cooking apparatus and cooks.
9. Each prisoner to have his own drinking mug and to keep this tied to his girdle. Each mug to be stamped with the owner's number. It shall be an offence for a prisoner to be found with another prisoner's mug.
10. Water tins to be pad-locked and each tin to be put in charge of a warder, who shall be responsible for it.

## Chapter II—Cholera in the Shambas and the Town.

Here I think I might go back to August 5th, *i. e.*, two days before any one imagined that cholera was present on the Island. On that date Mr. MacIntyre of the Agricultural Department wrote in informing the Registrar of Births and Deaths that four of his men had died "lately" and that one had been sent to hospital. The man sent to hospital apparently was not seriously ill as he was discharged the next day. These men had all been working on the Mtoni shamba. Mr. Parham, the Government Bacteriologist, investigated the cause of death of these four men, but could not come to any conclusion.

On August 13th it was reported that 3 deaths had occurred at the Mtoni Shamba. All of these in the light of our present knowledge were suggestive of cholera—but at the same time the source of their water supply—a filthy well was almost enough to cause death from enteritis to any one drinking it. The well was promptly filled up and closed and the huts, in which the patients had lived disinfected.

On the 16th, three more deaths were reported from the Mtoni district. Mr. Parham investigated these cases and as a result of his report I went out in the afternoon to see that the disinfection of the huts had been carried out. Since that day there was not any case suspicious of cholera until October 30th, when a man died with definite symptoms. These Mtoni cases were very disturbing as they were quite near to the source of the Town water supply. A guard was promptly put over the springs and all along the conduit route, and kept there until the Director of Public Works had succeeded in covering in securely all the vent holes in the main pipe line.

Summarised then the Mtoni cases, suspicious and otherwise, occurred as follows:—

| | | | |
|---|---|---|---|
| August | 5 | 4 deaths | |
| ,, | 13 | 3 ,, | (1 returned as cholera) |
| ,, | 16 | 3 ,, | |
| October | 30 | 1 ,, | |

It is practically impossible to trace the source of the infection or even the cause of the four deaths that occurred on or about the 5th August. They were reported as having died of "dysentery"—a disease that appears to be common, and a diagnosis that is even commoner.

But the Town Collector, Dr. Andrade, reported to me on the 17th August that the body of Mzee bin Husein, a prisoner, who died from what might have been cholera, and was not recognised to be such, had been removed from the Government Hospital and buried at Mtoni.

Now Mzee bin Husein, prisoner No. 685, was committed to the jail on July 29th. He was suffering from profound anæmia and dilated heart and died in hospital or in the jail the next day. It is just possible that this man was suffering from cholera. One other death from what we now know to be cholera was certified as having died from "anæmia and dilated heart". Those, who are familar with the customs and rites attending a Swahili funeral, will understand how easy it is for a cholera corpse to disseminate the disease. But, if Mzee bin Husein had cholera, we are no nearer arriving at the solution of the difficulty because we shall never know where he got it from.

On August 10th the Assistant Collector reported deaths with choleraic symptoms at Kimara in his District. I was away at the time the message was received and on the 11th when I went out I failed to find the shamba. But Dr. Charlesworth kindly went out to the district on the 13th and came to the conclusion that these people had died of cholera.

The impression at the time was, that the prisoner discharged from jail on the 5th had, in making his way to Tungu, fouled the stream at Fuoni. But unfortunately, no one either at Fuoni, or at Tungu, had seen or heard anything of this man, and, although, as I have said, great efforts were made by Police detectives to trace this man's movements, nothing has been found out. We must therefore be content with the bare fact, that the first case of cholera occured at Fuoni on August 8th. The grandmother of this case died on the 10th August. There was one other case on the 10th, one on the 11th and one on the 12th.

In consequence of Dr. Charlesworth's report, I stationed a Health Office Sub-Inspector at Mwera, whose orders were to report to me any deaths suspicious of cholera, and on the 17th he reported two. By the time I succeeded in getting there, 3 more deaths had occurred. Rigid measures of house disinfection and isolation of contacts, where possible, were then instituted.

The tables will show the villages and shambas attacked. (See Appendix)

*Bububu.*—The village of Bububu was attacked on the 20th August. The water supply is by a narrow stone conduit with a rapid stream of water in it. It is the custom to wash the body or clothes or draw drinking water all from much the same place. In two days four deaths from cholera occurred.

The first steps that were taken, were, (1) to disinfect the houses of the deceased as usual. (2) The people were collected—it is a compact village—and were urged to boil all their drinking water. (3) A guard of askaris was put on the water conduit with orders to seize anyone seen washing himself or his clothes in the conduit. (4) ~~And~~ a large quantity of permanganate was put in the water until the colour for a hundred yards was a deep red. There were no further cases at Bububu, nor have there been any since.

The presumption is, that some how this conduit became fouled, and only those people who were unfortunate enough to draw water quite shortly after the contamination got the disease.

The rapid stream, it may be supposed, washed away the infection, and fortunately lower down there was nobody to infect as the stream reached the sea.

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(*Note.*—I am inclined to think that since August a more complete death return has been obtained. The average death rate for the past five years in the Mwera district based on the returns we have works out at just over 20 per 1000 compared with one that is between 30 and 40 per 1000 for Mkokotoni and the Town, and Mwera is more unhealthy than either.)

*The Poor House.*—The Poor House at Walezo consists of 4 stone buildings and a few mkuti huts. The average number of inmates varies from 40 to 50.

Cholera broke out here on August 21st. The cases occurred as under :—

| | | |
|---|---|---|
| August 21 | ... | 1 case |
| ,, 22 | ... | 1 ,, |
| ,, 25 | ... | 1 ,, |
| ,, 28 | ... | 1 ,, |

The same precautions were adopted here as at the prison. Such measures were possible in this instance as only a small community was being dealt with.

Water was brought out by cart from Town and was stored in drums which were locked, the keys being in charge of the Sister. Previous to this the inmates had been getting their water from a well, which was found to be very foul and very low. Rain water was not available as practically no rain had fallen since early in May and the tanks were empty.

No further case of cholera occurred at Walezo Poor House after August 28th.

Dealing with Walezo, a very interesting point arises to which attention was first drawn by Dr. MacDonald, I think.

The Leper Settlement is quite close to the Poor House and on going over the Leper Settlement Death Reports, it was found that deaths had occurred on the following dates:—

| Date. | Name. | Length of illness. | Cause of deaths. |
|---|---|---|---|
| July 1 | Asumini | 3 days | dysentery |
| 2 | Bahati | ½ day | ,, |
| 3 | Sudi | 4 weeks | ,, |
| 11 | Asumani | 5 days | ,, |
| 12 | Saida | 14 days | ,, |
| 13 | Asemaye | 21 days | fever |
| 16 | ? | 1 day | dysentery |
| 16 | Zenaba | 4 days | ,, |

These deaths were reported to me verbally by the Sister in charge about the middle of July. I went out to inspect the wells and I found one very foul, and not much water in the new one. The old one was disinfected and cleaned out and the dysentery cases apparently stopped.

Now Dr. McDonald thinks, and he may be right, that these dysentery cases were really cholera. But no new case of leprosy had been admitted to the Asylum since April. If those cases of dysentery were cholera, how did the infection get in ? The Swahili does not particularly object to the leper unless he is very bad, and it is quite possible that visitors do come to the Asylum. What we do know is, that the lepers not infrequently escape and visit the surrounding villages.

Walezo Leper Asylum is situated on the highest point practically in the Island. It is almost on the ridge between the two main water sheds—the Western one falling away towards Mtoni on the sea, and the South Eastern one towards Fuoni. Due East is the Kianga district, in which one of the branches of the Mwera river rises.

But cholera could not arise spontaneously at the Leper Asylum, so that it must have been brought in from somewhere. This then would bring us back to about June 25th.

## *Mwera District.*

During October in the Mwera District 85 cases were reported, the district immediately round Mwera Bridge (19 cases) being chiefly affected. Kianga came next to Mwera with 14 cases, and then Machui with 12.

*Water Supply to Mwera District.*—The water supply to the Mwera District in general is rather complicated. The Mwera River, which, at best, is only a small stream, rises, near Kianga as to one of its branches, and near Koani as to the other. These two streams, which are practically natural ditches draining continuous swamps, unite just North of the Mwera Bridge. The stream continues its way for perhaps another 10 to 15 miles, when it disappears into a hole near Kibonde Mzungu.

It cannot be said, that there are any large villages actually on the banks, but all along its course there are huts, the inhabitants of which go down to certain clearings on the banks of the stream, where they draw their water for drinking, cooking, etc., or wash their clothes and themselves. Now it was extremely likely that this stream had become infected and the problem was, if that was the case, how were the villagers to be kept away from it. It was suggested that the river should be guarded along its length by police or soldiers but this was an impracticable suggestion from the first. In the end, all that could be done was to keep on telling the villagers not to drink the river water without boiling it first. This was told them day by day, till it became a formula and as a matter of fact, eventually, they came to follow the advice.

On the other hand looking back on the matter, it is quite possible that the stream was never infected at all, because in the first place vibrios were never recovered from the river water, although analysis were made on various occasions; and in the second the early cases appeared near where the stream ends and the later ones where it had its source; whilst in the third place the district infection was never severe enough for an infection of a common water supply. It is therefore legitimate to suppose, that the spread of the infection was personal, by which is meant, that contacts were the carriers.

The Public Health Department made every effort it could to get all the contacts, but in the early stages the difficulties were great. In the later stages, large numbers of people were removed to Gulioni Contact Hospital, as it was impossible sometimes to find out who had actually attended the case and who had not. This was necessarily rather a drastic measure and at the time caused a good deal of feeling among the people, but after a time they realised, that going any where near a "tumbo" case meant being removed to Gulioni, and so they wisely stayed away.

The case of the human carrier as against a water-borne infection is strengthened by the fact that among the early cases the women suffered more than the males; this I explain by the customs of the country, where the women sit in the hut where the death has occured as mourners.

A difficulty, that had to be got over was to stop the practice of "uffuo", which means, that it is the custom for the heir to sleep on the exact spot where the sick person had died. We got over this in the first instance by using Jeyes powder very freely, and as the native objects most strongly to the smell, he abandoned the custom, and in the second by removing the roof. In the rainy weather of November and December this helped considerably.

During November, 56 cases were reported, the infection occuring in 13 new places.

Villages on the borders of the Chwaka District like Uzini, Pagali, etc., probably became infected by people, who came from the East Coast villages. Mwera in fact became a kind of filter or "buffer state" for cases from Mkokotoni or Chwaka. There is, for instance, a road used a great deal, which runs from Mkokotoni *via* Chaani, Uzini, Dunga and Mwera Bridge to Town. Travellers from Ndudu Mkubwa, Pongwe, and Urua pass through Uzini, whilst Tunguu drains Bweju, Jambiani and even Makunduchi.

During November Uzini suffered most, there being 10 cases in the village.

The last case of cholera in the Mwera District occurred at Buzini on December 1st.

The total number of cases in the District was 186 during a period of 116 days. The population is reckoned to be about 30,000. Cases occurred in 40 villages.

*Combative Measures.*—It has already been remarked, that in the later stages of the epidemic, the Mwera District acted as a filter and received cases from distant infected villages which might have got into Town. A very much larger staff was therefore required for this District, firstly because the distribution of cases was very wide, secondly because it is a densely populated district, and thirdly, so that every possible effort should be made to keep cholera out of Town. It is a District traversed by good roads, so the Public Health staff could get at the cases earlier, and therefore it suffered less than, either Mkokotoni or Chwaka.

As is shown in the Appendix, head-quarters for disinfecting gangs were established eventually at Dunga, Koani, Mwera and Kibonde Mzungu.

A contact camp was formed at Dunga, which is a place in telephonic communication with Town.

Infected premises were dealt with by treating the interior with a mixture of lime and Jeyes powder in the proportion of 15 to 1. Over 3,000 houses in the District were treated in this way. In some cases the roof was removed. Drinking vessels were sterilised or destroyed. Clothing and bedding was burnt and compensation paid.

Supplies of a sulphuric acid mixture were distributed to the Masheha for daily administration to any who cared to take it. After a time it became almost a popular beverage.

It was found that large supplies of milk were being brought into Town for sale from the infected areas. An order was therefore issued prohibiting milk being brought into Town at all, and police were stationed on the roads to enforce it.

It was then discovered, that this drastic measure caused something like a milk famine, so depots were established in 3 places on the main roads. All milk brought in was boiled, the bottles or tins were scalded and when rebottled the vessel was sealed and labelled with a Health Office permit. This plan appeared to work well. The milk was certainly sterilised. The milk trade was not dislocated and no one made any objection.

### *Mkokotoni District.*

Information to the effect that cholera had broken out in the Mkokotoni District was received on Sunday October 20th. Dr. Carment and I motored to Mkokotoni, where we were met by Mr. A. H. White, the Assistant Collector. He informed me that 23 deaths from "tumbo" had been reported to him as having occurred at Chaani on the 19th and 20th October.

We all went on bicycles to Chaani and had an interview with Mwalimu Ussein, the Sheha, who undertook to give us all the assistance he could. Ussein is an old man, and he remembered the former outbreak of cholera in the Island. He admitted that the symptoms of the present cases were similar to those of the earlier outbreak. There appears to be little doubt that the cases which occurred on the 19th and the 20th were the first cases in the District. Mr. White has been in very close touch with his District and any earlier or suspicious case would have been reported to him at once. The infection probably came in direct from the Mwera District, as Chaani is on the direct shamba route between Mkokotoni and Mwera, between which centres there is a good deal of traffic.

The total number of deaths from all causes for the month of October reached 205, this being higher than any previous figure, during the last 18 months; and as only 20 of this total death rate had occurred during the first eighteen days of the month, it gives an average daily death rate for the last 13 days of the month of about fourteen.

The population of the Mkokotoni district is roughly 30,000.

After having visited practically all the villages in the District, and having obtained the history of all the cases of death from "tumbo", it was obvious that the Chaani area, which comprises mainly two villages, Chaani Mkubwa and Chaani Ndogo, on opposite sides of the river Chatu, was the focus from which the disease has spread.

The total female deaths in this epidemic exceeded that of males, and one naturally thinks that the women have been the chief offenders in spreading the disease. It was quite common to be told, that a woman after having attended a funeral in Chaani came home and died within a few hours. The difficulty of getting at the female population and urging them to take the necessary precautions, was the chief obstacle in dealing satisfactorily with the epidemic.

By end of October there had been 126 deaths from cholera in this District, the greater number of deaths occurring on October 21st and 29th, when 17 deaths were recorded on each of these days.

During November, 120 deaths were recorded, but the disease began to slacken on the 14th. After the 18th November the daily incidence became intermittent, as can be seen from the tables. The last deaths occurred on December 2nd, *viz.*, two at Pani Mchangani, and one at Pitanazako. Thus in the whole District 229 persons died from cholera in the space of 56 days, an average of 4 per diem.

The distribution of the disease was very wide. It extended up the Coast as far as Ras Nungwe, and many of the remote villages on the Eastern Coast became stricken with the disease. But it was the densely populated central part of the District that was chiefly effected. A feature of the epidemic is the way in which the Bumbwini District escaped. This district extends, roughly, from Mangapwani to Mkokotoni, and is bounded on the East by the main road. It is densely populated and very much cultivated, and there is a considerable trade and movement going on between this area and the infected districts round Chaani and Mwera. It derives its water partly from a river which traverses the district, or from wells as in other parts of the country.

*Tumbatu.*—Fortunately the Island of Tumbatu escaped infection. Every effort was made by the Assistant Collector and the Health Officers to restrict communication between this rather turbulent Island and the Mkokotoni District. As the water supply of the Island is very limited and derived from one well, had their only watering place become infected, the inhabitants must have suffered very severely indeed. The difficulties too would have been the greater, as the Watumbatu are a people with small liking for European medicine or methods of combating disease and the opposition to anti-cholera measures would have been very pronounced.

It was in fact a very fortunate circumstance, both for the Watumbatu and for the Health Authorities, that cholera never succeeded in invading this Island.

Chaani suffered very greatly in excess of all other villages in the district. There were 114 deaths in this village alone. It is of course the largest village or collection of huts in the district; still this mortality is very high.

It seems hardly necessary to point out the difficulties experienced by the Health Office workers in getting to some of the more remote villages. The main road ends just beyond Mkwajuni. From here small shamba paths proceed in various directions. Over many of them a bicycle can be ridden, but once past Upenga going East, there is nothing for it but to walk on account of the rocky nature of the ground.

Going North towards Ras Nungwe, the difficulties of the march are still greater. The ground is all sharp coral rock, and a bicycle is useless.

*Combative measures.*—Two bandas were quickly run up at Mkokotoni for the reception of contacts.

Dr. MacDonald very kindly placed his small hospital at the disposal of the Health Office for the only case that could be brought in.

Advanced depots for disinfectants, etc., were established at Mkwajuni and at Chaani, and from those the disinfecting gangs drew their daily supplies.

The Port of Mkokotoni was closed and all dhow traffic stopped.

The Masheha were supplied with a stock mixture, with instructions to administer this at once in all cases of diarrhœa, and then to send a runner in to headquarters without delay for further help.

It need hardly be said that the rule was for the village Sheha to give the medicine and then to wait and see what happened. If the case died, he reported it; if it recovered, the Health Officer heard no more about it, except that every now and then the Sheha would remark that the medicine was good or bad according to the measure of his success in treatment.

Wells were permanganised, and although there was some slight objection at first on religious grounds, a letter from the leading Kathi in Zanzibar, to the effect, that permanganised water might with right be used for religious ablution purposes, served to allay the scruples and prejudice of the people.

The usual treatment was meted out to infected houses. The floors and walls were well treated with lime and Izal or Jeyes powder in the proportion of 15 to 1. Whenever possible, contacts were removed to the contact camp at Mkokotoni.

## *Chwaka District.*

*Bweju.*—On 18th October information was received at the Health Office, that on 4th October a man had died with symptoms of cholera at Bweju, which is a remote village on the Eastern littoral. Later information showed that a second man had died with definite choleraic symptoms on the 10th October in the same village.

The difficulties at that time of dealing with Bweju were very great. It is just a scattered collection of huts by the sea, and inhabited by people who practically never leave their village. They live by fishing and their women look after the small patches of cultivated ground which each appears to possess. Thus Bweju is practically isolated. It is approachable by sea from the North and South only at certain tides on account of the reef. By land it can only be reached after a long and tedious march from Chwaka.

*Chwaka Village.*—Chwaka village became infected possibly through a boy called Hadji who was a Government bicycle messenger. His duties brought him to Zanzibar *via* Mwera. This boy was taken ill with symptoms of diarrhœa on or about the 9th October. On the 13th it was reported to the Health Office that he had been ill, and on the 14th, when Dr. Carment saw the case, the boy was practically well. A peptone tube was inoculated from a rectal scraping, but no vibrios were found in it after 24 hours' culture. The boy died suddenly after some severe exertion on the 17th.

By this time other deaths were reported, so a small field hospital was rapidly organised. It consisted of 3 huts, one of which contained 3 rooms. The idea was to use one for the reception of sick, and the others for contacts. The whole was fenced in and put under guard.

The village of Chwaka is a collection of some 300 huts built closely together. It derives its drinking water from five wells, only two of which are worthy of the name.

Government officials however get their water from rain water which is collected off the roofs and stored in three underground tanks.

There is a good deal of traffic along the main road through Mwera into Town, and the wonder really is, that cholera was not introduced into Chwaka earlier than it was.

Cases continued to occur in Chwaka village at intervals during October, four occurring on the 29th. Altogether in October, there were 10. After 15th November the disease abated and the last case occurred on 21st November. The total number of cases was 28. The population of Chwaka village may be said to be about 1,000.

*Ndudu Mkubwa.*—On 1st November it was reported that Mdudu Mkubwa, a small fishing village north of Chwaka, had become infected. On arrival there, it was found that the whole of the inhabitants of the village, except 2 old men and a lunatic woman, had fled. A house to house visit was made and one woman almost dead of cholera was found. The old men said there had been no communication with Chwaka, but that people had come from Bweju, Uzini and Mkokotoni. From the terrible suddenness of the outbreak and the fact that practically half the village became infected about the same time, it is permissible to infer that the only well in the village had become infected.

*Urua.*—On returning from Ndudu by march two cases were discovered in a hut at Urua, one was dead and the other dying. The former was hastily buried and the latter brought into Chwaka, where in spite of medical aid he died next morning. No contacts of these two cases could be found. The woman who had looked after them had fled into the bush on our approach.

The above description will give an idea as to how cholera gets spread in an area like the Chwaka District. On the first appearance of a few cases in these coast villages the rest of the inhabitants flee into the bush or take refuge with friends or relatives in a neighbouring or even a distant village. An instance of this migration came to light towards the end of the epidemic. A man was found dead on the road near Tungu. Alongside him were three baskets containing poultry. A few miles further back, on the Urua road was found another dead man. It can be supposed, that originally three men had started from Urua, each carrying his basket of poultry. One died and the other two left him but took along his basket of fowls. The second man fell dead by the way side, and the last man went on with the three baskets until he also succumbed.

The services of Dr. J. S. de Sousa were placed at the disposal of the Public Health Department, and this Officer took charge of the Chwaka District on October 31st. His staff in the first instance consisted of a Dispenser resident at Chwaka, and a sub-inspector with 8 men specially engaged for cholera work. Dr. de Sousa made his first tour to the South by galawa between 2nd and 5th November. He visited Bweju, Paji, Jambiani and Makunduchi. As far as he could ascertain cholera had not at that time reached the important Southern villages of Jambiani and Makunduchi. At the villages he called at, he assembled the people and the Masheha, and gave them a short account of the disease, its causes and symptoms, and dwelt with emphasis on the preventive measures. It was left to the people to follow his advice and come for disinfectants.

The Sheha of Jambiani and the people were warned against allowing any of the inhabitants of Paji or Bweju entering their village, but they were not vigilant enough, and the result was, that cholera eventually broke out in Jambiani.

Dr. de Sousa realised that, if he was to patrol the South Eastern coast, he could not do it by sailing boat, and so the H. H. S. "Cupid" brought round a motor boat for his use. Without this boat it is possible that the situation in the peninsular could not have been dealt with nearly so effectually as it was.

By the middle of November cholera was widely distributed through the district, cases were being reported all along the coast. Dr. de Sousa practically lived in the motor boat, spending half the week going north, and the other half going south about.

On November 14th, the askari who had accompanied him on his expeditions, contracted cholera and died on the 15th. This accident demoralised his boys and staff, and he had the greatest difficulty in keeping them together.

H. B. M's. Agent and Consul-General inspected the East Coast on H. H. S. "Cupid" between the 19th and the 24th November, and most of the cholera striken villages were visited.

In the later part of November a system of road guards and a contact camp was organised at Makunduchi. The road guards were ordered to bring in any strangers or villagers from the infected area, who were trying to get into Makunduchi, and confine them in the contact house there.

The scheme worked successfully, and during December cholera was, so to speak, "bottled up" in the Paji and Jambiani areas.

The last case of cholera in Jambiani occurred on 13th December, in Paji on the 15th, and at Michamvi on the 23rd. This case on the 23rd turned out to be the last case in the Island.

Dr. Carment relieved Dr. de Sousa on 17th December.

The total number of cases that have been reported from the Chwaka District is 442 cases in 80 days—an average of 5·5 per diem.

Compared with the Mkokotoni District, this gives a daily incidence of about 11 cases, as the population of Chwaka is about half that of Mkokotoni.

The severity of the disease in Chwaka is no doubt due to the remoteness of the various infected areas and utter impossibility of getting to them quickly.

Bweju lost 87 people, and Jambiani 125. These figures must represent practically 10% of their respective populations.

### *Zanzibar Town.*

The chief endeavour of the Public Health Department was to keep cholera out of Town, or at all events to prevent it becoming epidemic.

Deducting the 42 cases of cholera that occurred in the jail or among the prisoners at the Quarantine Station, only 14 cases cropped up in the Town or suburbs. In the Town Proper there was only one case and that one most fortunately occurred in a house almost opposite the Health Office, the remainder came from N'Gambo.

With the exception of the 2 cases that occurred on the 18th August the infection was clearly traceable to the country districts; either the victims had attended the funeral ceremonies of some friend, or relative or had been a contact of some case in the shambas. An order was promulgated early in the epidemic prohibiting an employé of the Government from going into the shambas at all on any pretext whatever without a permit from the Health Office, under penalty of instant dismissal. If circumstances warranted the grant of a permit the man was quarantined at Gulioni on his return for 5 days.

The period of greatest anxiety was in the middle of October when the incidence of cases was as follows :—

| | | |
|---|---|---|
| October | 18th ... ... ... | 2 cases |
| ,, | 19th ... ... ... | 1 ,, |
| ,, | 20th ... ... ... | 1 ,, |
| ,, | 21st ... ... ... | 1 ,, |
| ,, | 22nd ... ... ... | Nil |
| ,, | 23rd ... ... ... | Nil |
| ,, | 24th ... ... ... | 1 case |
| ,, | 25th ... ... ... | 3 ,, |

From any of these a severe outbreak might have taken its origin.

One of the above was a grass cutter to one of the big dairies. Fortunately the news of the case was immediate, and the patient was removed to Gulioni where he died; but inside a quarter of an hour all the milk in the shop had been seized, the milk vessels and the house were promptly disinfected and all contacts removed to Gulioni.

But the fact stands out clearly, that in spite of cases of cholera cropping up practically all round the Town and quite near to it, in spite of the constant traffic to and from the infected areas, the Town of Zanzibar with a population of about 40,000 escaped very nearly altogether.

It is almost impossible to say to what cause the comparative immunity of the Town from cholera was due. A factor that has to be considered is the safe water supply to the Town. As has already been mentioned one of the very first steps taken on the discovery of the outbreak was to put a guard, and an effective guard, along the main conduit line and over the collecting area.

The Director of Public Works, Mr. Galbraith, spared no efforts to get the vent holes along the conduit filled in. His promptness and energy may have been a factor of the very greatest importance in preventing epidemic cholera.

The importance of immediate notification of a case of sickness or death in the bazaar must not be overlooked. A reward of Rs. 5 was offered to any one bringing the Health Office information. The Town Crier, who was sent round to advertise this reward, was assaulted, but this simply increased the advertisement. I think it may be said, that no single death in Town went unrecorded. This information led to immediate investigation and preventive measures.

House contacts were got at early, the house was disinfected immediately and put under Police guard. So stringent were the measures, that houses were disinfected in all cases unless the cause of death was absolutely clear.

The regulation of the milk supply was no doubt a third point. The measures taken to ensure a non-infected milk supply are detailed elsewhere.

Every public well in the Town was treated with Permanganate of Potash by a special staff as a routine measure during the continuance of the outbreak. As a register of wells is kept in this Office, this service could be carried out absolutely systematically.

## CHAPTER III—ORIGIN OF THE OUTBREAK.

Among civilised communities the difficulties of tracing the source of infection in any epidemic, though great, are generally overcome. But in tropical countries, and where epidemic disease breaks out among primitive people, the difficulties of tracing the cause are frequently insuperable. As an instance of this difficulty I may mention, that in such an important matter as the plague, which appeared first in Bombay in 1896, the actual source of infection has never been traced, though it is supposed to have been brought in from Hong Kong.

In the case of cholera, however, when compared with plague, yellow fever, small pox and other virulent diseases, we are face to face with the "carrier problem"—that new menace to tho health of communities and a human vector of disease, whom it is almost impossible to deal with. The carrier is a difficulty almost new to modern epidemiology, except in the case of typhoid carriers, and it is one that public health authorities have not yet quite decided how to deal with.

As regards the origin of the Zanzibar epidemic of 1912, there are but two means by which the disease could have arisen. They are:—

(1) That it had been introduced from without by a "carrier"—for it is quite certain that no actual *case* of cholera had slipped past our sanitary outposts, protected as we are by the Seychelles and Mombasa from India, and by the Portuguese and Madagascar ports on the South; or,

(2) that the disease has been endemic in the Island, existing either in a mild non-epidemic form or else latent altogether.

Dealing with these paths of origin in turn let it be assumed, and it cannot be anything but an assumption, (1) that the four deaths from dysentery (noted in the description of the disease at Mtoni, on page 34) which occurred previous to or on August 5th, were cholera; (2) let it be assumed again, that those deaths, also put down to dysentery, which occurred at the Walezo Leper Asylum, were in fact cholera. The first of these died on July 1st, it will be remembered. The incubation period of cholera is for all practical purposes about 5 days, and in a great many cases very much less—it may be only a few hours. The leper who died on July 1st must therefore have acquired the disease some time between June 27th and July 1st.

Now I find on reference to my Port Sanitary Service records, that the B.I.S.N. Co's. steamer "Palamcotta" arrived in Zanzibar from Bombay on June 25th. The Bombay bill of health noted 21 cases of cholera in that port during the week previous to her departure. Four deaths occurred on the voyage, 1 from diarrhœa, on June 12th a child aged 13, one from heart failure, and the other two from some other non-intestinal disorders. The death from diarrhœa occurred before the ship arrived at the Seychelles—there was evidently no suspicion of cholera attached to this case as the ship was given a clean bill of health at the Seychelles—a port ,where the authorities are almost ultra-careful. The

"Palamcotta" brought 72 3rd class and deck passengers to Zanzibar, a large number of whom must have come from Mombasa.

Here then is a possible track :—(1) The "Palamcotta" arrived here on June 25th, coming from a port where there nearly always exists sporadic cholera. (2) Five days later a man died at a place four miles away from the port of arrival. (3) There is a sequence of intestinal complaints in an institution which lasted up to July 16th. (4) On August 5th it is reported that four men have died "lately" from a disease the symptoms of which were choleraic. There does seem a possible connection, until the arguments on the other side are examined :—

*(a)* The Seychelles are at a distance which is outside the incubation period of cholera;

*(b)* no case of cholera has been reported from Mombasa or the Seychelles;

*(c)* the Indian passengers, who are the only persons likely to have been in close contact with the child who died at sea with diarrhœa, have no connection that we know of with the Swahili Leper Asylum;

*(d)* there is a gap of almost 20 days between the last death at Walezo and the first death at Mtoni.

Just to mention these four objections only, seems to me sufficient to make it doubtful, that the "Palamcotta" brought cholera to the Leper Asylum. These arguments however do not rule out the fact, that the "Palamcotta" or any other ship may have brought a "carrier" over with them. The most potent objection to the carrier theory however is the fact that cholera has not appeared spontaneously in the Town, *i. e.*, in non-imported form, except in two cases, and these two cases occurred a fortnight after the disease appears to have been found at Mtoni. A cholera carrier should have spread the disease first in the Town of Zanzibar and afterwards in the shambas, which is the reverse of what was the actual case.

Thus I think the case for the importation of the disease from without breaks down. At best it is only a hypothesis, the evidence is weak and the links in the chain fragile.

(2) Has cholera been endemic in Zanzibar since the seventies?

As I have said unless the disease has been brought in by a cholera carrier, this is the only other theory that can be discussed. Let me therefore call attention to some of the arguments for and against this hypothesis.

I shall take the Mwera District first of all because since 1906 the death records are said to be fairly complete and accurate†.

From 1905 to 1909 the average number of deaths in this District per annum was 567·4. During the same period the average number of deaths ascribed to "stomach complaints" was 169·4, that is to say, that during this half decennial period the deaths from intestinal disorders was 29·3 per cent of the total.

"Tumbo" or stomach ache has always been looked upon as common disease among Swahilis it is true, and the cause has usually been put down to overeating unripe mangoes. But the "stomach ache" death rate is highest between June and September, which is not the mango season, therefore some other cause should be looked for.

These months are usually dry months; in July and August the wells are at their lowest and many streams are dry. Such water as is left must be more polluted than at other times of the year, or the pollution is more concentrated, I should say, as all water supplies in the shambas are polluted more or less.

Looking at the table of deaths, month by month, a curious fluctuation is noticeable; 671 in 1905, followed next year by 695, then a drop, then a steady rise in 1910 and 1911. In 1912 there was a monthly rate which was lower than the average for the two preceeding months until August, when it doubled itself, rising to 121, and the October rate is higher than it has ever been since records were kept.

I have not got the complete records from Mkokotoni, but here comparing 1911 and 1912 it is found, that except for January, every month in 1911 had a death rate almost half as high again as the corresponding months of 1912.

Now what is the relation of endemic to epidemic disease?

Working on the analogy of plague, this disease has been endemic in parts of East Africa without becoming pandemic or even epidemic; Again, Sir Rupert Boyce insisted that yellow fever has been endemic in West Africa all the years that the country was supposed to be free from it. Yellow fever became epidemic certainly on the West Coast of Africa about 1908 and there was no sign of its having been introduced from any American centre. In other words epidemiologists are coming to agree, that there is a latency about disease, which is inexplicable.* In Clifford Allbutt the following passage occurs :—" We are still far from explaning why cholera is epidemic at one time, and then at another completely disappears, for we have no ground for thinking that the known conditions of its dissemination have ceased to become operative during these periods of quiescence". This paragraph, I hold, is one of great importance. Cholera for instance is always to be found somewhere or other in the valley of the Ganges. It wanders about from village to village. Small epidemics arise and then die away. It is presumed that the vibrio is in the soil and gets washed from time to time into the wells.

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† See however note on page 35.

Cholera, I think it may be said, is practically endemic in the Hedjaz, although from time to time the authorities announce that the territory is free, yet it recurs frequently and every now and then blazes forth with great virulence. These points, although they may be well known to many, are recalled, simply to emphasise the fact, that cholera may and does exist in certain countries in a latent form. Then stimulated by factors, the nature of which we are ignorant, the causal organism regains or re-acquires its former virulence.

So far as I can see, the only argument against the latency of cholera in Zanzibar is, that it has remained quiescent for so long. We do know that the disease has been in the Island in former days and was very virulent. This visitation could not have been checked by any scientific means, as 40 years ago practically none were known, and at that time in Zanzibar there was certainly no machinery for putting into force what few measures were known. The disease died away of its own accord, as it has always done in other countries, but that is no reason I suppose why it should necessarily disappear entirely from a country like Zanzibar, or die out among people, whose habits are such, as simply to encourage it to remain. Once started there remains no need to speculate as to the means of its spreading.

We can I think almost safely say it has not been entirely stream-borne. There is no connection between the water supplies at Mtoni, Bububu, Fuoni, and Uzini, just to mention a few places.

The infection, as I understand it, has been what I call "domestic", as opposed to stream-carried. This postulate has two exceptions and a possible third. The two certain ones are Bububu and Mdudu Mkubwa.

In the latter place, within a few hours 13 people in the village were dead of cholera and in a few days nearly half the population. There is only one well and all draw water from the same place. That well became infected from a stranger who had come from Uzini or Chaani or some other infected district. Bububu again was a stream infection, but being a rapid water-course the infective material must have been washed away. The disease has undoubtedly been carried from village to village by the people who have come, according to custom, to mourn or rejoice in the dead man's house.

The custom when any one dies is for all the neighbours, friends and relations, and the more the better (I may add that people go very long distances to a funeral) to assemble in the hut where the corpse is being washed. As many as 70 or 80 women I have seen in one small hut, all squatting on the ground chanting. The deceased no doubt has vomited, passed his excretions practically speaking all over the ground. It requires no imagination to see how the women could infect first themselves and then the family water jar into which they dip their hands to get water. And this is borne out by the large number of women who have fallen victims. And so it has gone on being spread from house to house in this way. I refuse to believe that the Mwera river has been infected, at all events to any large extent. If it has, the infection has spread against the stream, because the early cases on this river appeared near to where the stream ends in a hole in the ground at Kibonde Mzungu and the later cases occurred at Kianga and Kimara near its source.†

The Chaani infection may have been either by well infection or by the Chaani river, because in order to reach Chaani from Mkokotoni the river has to be forded.

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* Sambon and Chalmers have stated that pellegra is endemic in the British Islands and has not been recognised as such. And further they have made out a very good case for their contention.

† The epidemic of cholera which delayed the Dongola Expedition of 1896-98 started in Cairo and worked its way up the Nile until it reached Wady Halfa. It stopped at the outposts of the Expeditionary Force and did not find its way into Khartoum. It has not been suggested that the Nile was infected.

So much for the origin of this epidemic.

I am inclined to the view, having failed to find out how it could have been introduced from without, (1) that the disease has been existent in Zanzibar ever since the last great epidemic; (2) that it has existed in a mild and unrecognised form, the so-called "tumbo"; or (3) that it has been latent altogether and that some factor of which we know nothing, has caused it to regain its former virulence.

Not the least interesting point in the epidemiology of the Zanzibar cholera outbreak is the reason for its sudden and almost dramatic disappearance.

On December 1st there was one death from cholera in the Mwera District, whilst on December 3rd there were 3 deaths in the Mkokotoni District. Since these dates no case has come to notice. During November in both Districts there had been deaths almost daily amounting to 56 cases altogether in Mwera and 120 in Mkokotoni. And yet almost suddenly within a period of 3 days the outbreak ceased in both Districts, that is to say over about two thirds of the total area of the Island.

On 23rd December the last known case in the Island occurred at Michamvi in the Chwaka District.

This sudden cessation was not to be accounted for by any increased vigilance or activity on the part of the Health Office. There was no marked change in the meteorological or climatic conditions. The outbreak to all intents and purposes suddenly ceased in the same way that it did 40 years ago.

It had lasted practically 5 months.

I observe that it took about 5 months to get cholera out of Marseilles during the epidemic in that city.

## Chapter IV—General Character of the Epidemic.

*Type.*—The habits of the people, whereby it was almost impossible to persuade friends of the sick to report the case before death, render it difficult to give any idea of the relative fatality at any stage of the epidemic. From the tables, it will be seen, that out of 931 recorded cases there were 900 deaths. This of course is an appalling mortality figure. It is only reasonable to suppose that there have been a large number of cases in the outlying shambas, that recovered, and of whom the Health Department have never heard.

The mortality figure of those cases that were admitted to Gulioni Hospital for treatment was 36·7%.

Even here, however, some allowance must be made for the fact, that many were admitted in what was practically a moribund condition.

In order to give an idea of the virulence of the epidemic, the result of the examination of notes on 136 cases that occurred in the shambas may be of assistance.

| Duration of illness | Number of cases | Per centage |
|---|---|---|
| Death within 4 hours of the first symptoms ... | 7 | Approx. 5 per cent. |
| ,, ,, 24 ,, ,, ,, ... | 13 | ,, 9 ,, |
| ,, ,, 24-48,, ,, ,, ... | 51 | ,, 37 ,, |
| ,, ,, 2-3 days ,, ,, ... | 24 | ,, 17 ,, |
| ,, ,, 3-4 ,, ,, ,, ... | 20 | ,, 14 ,, |
| ,, ,, 4-5 ,, ,, ,, ... | 6 | ,, 4 ,, |
| ,, ,, 5-6 ,, ,, ,, ... | 4 | ,, 3 ,, |
| ,, over 6 ,, ,, ,, ... | 11 | ,, 8 ,, |
| Total ... | 136 | |

In other words over one half died after less than 48 hours illness, a figure which shows how virulent the disease was.

As has already been mentioned, the case mortality among the prisoners was 54·7%, a figure that is about the average for a native population at the beginning of an epidemic.

*Symptomatology.*—Text book descriptions of cholera would seem to lay considerable stress on the various stages of the disease, *viz.*, the stages of incubation, evacuation, collapse, and reaction. It must be admitted, that in the cases which came under notice, these stages were, in by far the greater number of cases, absolutely unmarked. The stage of evacuation was almost invariably associated with marked collapse. In the majority of instances the character of the diarrhœa was fairly typical, and it was observed, that the "rice water" stage was reached very rapidly. Vomiting was a constant feature, as also were the muscular cramps. The coldness of the skin to the touch was in many cases very striking. A feature, which the unqualified assistants especially looked for, was the wrinkling of the skin of the fingers, which, from their accounts, was very commonly observed. Suppression of urine was met with once only.

As to the varieties of the disease, the following came under natives :—

*The ambulatory.*—Two distinct cases were discovered almost accidentally. One was a nurse, who had had slight diarrhœa for a day or two, but a bacteriological examination showed vibrios, which eventually on culture conformed to type. Her blood gave a well marked agglutination reaction. The other was a servant who was suffering from a trivial indisposition. Without doubt there must have been many other cases, but these two show amply the danger that ambulatory cases may be in cholera epidemics.

*Cholera sicca.*—Two cases occurred in hospital, and there were clear descriptions of many others in the shambas. One of the hospital cases was dead within 8½ hours without any sign of diarrhœa or vomiting. A case was reported in the shambas of a man who went out to his work quite well. He was up a coconut tree and feeling ill he descended. He lay down at the foot of the tree, called for help and was dead in an hour.

The *typical* variety was by far the commonest, *viz.*, that associated with diarrhœa, vomiting, cramps and a sub-normal temperature.

There is no case in the records of the *hyperthermic* type. The following table shows the history of 16 cases admitted to hospital. They have been selected at random from the case sheets as examples.

## FATAL HOSPITAL CASES.

| No. | Name and Sex | Duration of illness | In Hospital | Diarrhœa | Vomiting | Suppression of urine | Cramps | Temperature (Qahr.) | Treatment. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | S. S. (M) | 5 days | 24 hours | constant | constant | yes | yes | 95-97 | Pot. Permang. pill. Salol. Stimulants |
| 2 | D. A. (F) | 16 hours | 16 hours | none | once | no | slight | subnormal | Do. |
| 3 | Z. M. (M) | 8½ hours | 8½ hours | none | none | no | ... | 94 | Stimulants |
| 4 | A. M. (M) | 2 days | 36 hours | constant | twice | no | yes | 94-95 | Pot. Permang. Stimulant-Adrenalin |
| 5 | D. A. (M) | 6½ days | 6 days | constant | frequent | no | yes | 95-98 | Castor oil Salol Bismuth opium |
| 6 | B. A. (M) | 6 days | 5 days | constant | frequent | no | persistent hiccough | | Stimulants |
| 7 | M. J. (M) | 2 days | 22 hours | frequent | frequent | no | at the end | 94-95 | Salol. Bismuth and opium Stimulant |
| 8 | J H. (M) | ... | 4 hours | frequent | twice | no | yes | 95-96 | Do. |
| 9 | H. J. (M) | 24 hours | 9 hours | 4 | 3 | no | yes | subnormal | Adrenalin |
| 10 | F. M. (M) | 24 hours | 5½ hours | constant | none | no | yes | 94 | Stimulants |
| 11 | S. A. (M) | 5 days | 5 days | constant at first | frequent | no | yes | 95 | Do, |
| 12 | K. M. (M) | 24 hours | 6 hours | none the last day | | | yes | 95-96 | Pot. Permang. Salol Stimulants. |
| | | | | 3 | none | no | yes | subnormal | Do. |
| 13 | J. B. (M) | 6½ days | 6 days | constant at fitst | frequent | no | yes hiccugh | | |
| | | | | none the last day | | | presistent at the end | 95-98 | Do. |

## NON-FATAL CASES.

| No. | Name and Sex | Duration of illness | In Hospital | Diarrhœa | Vomiting | Suppression of urine | Cramps | Temperature (Qahr.) | Treatment. |
|---|---|---|---|---|---|---|---|---|---|
| 14 | H. B. (F) | 6 days | 21 days | frequent | none | no | no | 97-98 | Salol-Stimulants |
| 15 | S. A. (M) | 2 days | 21 days | frequent | yes | no | no | 98 | Ditto |
| 16 | M. M. (M) | 2 days | 21 days | slight | no | no | no | normal | Ditto |

*(3) Diagnosis.*—This was by no means easy, especially in the early stages of the epidemic. In a country, where dysentery is common, where "tumbo" or stomach complaint is well known to the people, there were many difficulties. At the beginning, at any rate, an attempt was made to get bacteriological confirmation. Even after death a platinum wire was passed *per rectum*, a tube of peptone salt was inoculated from this and the diagnosis in many instances made in this way. This practice, however, caused a good deal of offence to the people; it was therefore abandoned. Again, in some cases, the v. choleræ was recovered from the soil under the bed, or even from a cloth which had been used by the patient. In the later stages, however, owing to the great amount of bacteriological work in hand, the diagnosis in the greater number of cases had to be made on the history of the symptoms as related by the friends. In order that as many points as possible could be made the inspectors were given a form, which had to be filled in, and sent to the Health Office either in the evening, or as soon as possible next day. A typical completed form is shown hereunder.

"REPORT ON SUSPICIOUS CASES OF CHOLERA.

Name, Hamisi bin Cubo.
Age, about 12 years.
Sex, male.
Nationality, Mdigo.
Residence, Kinuni, House No. 1.

1. How long has the patient been ill, since yesterday.
2. When was he taken worse, 9 hours prior to death.
3. Did the patient's body feel cold or hot, cold.
4. Did he complain of pains any where, yes.
5. If so, where, all over the body.
6. Had the patient taken food as usual, yes.
7. Had he vomited, yes.
8. If so, how often, 3 times.
9. What sort of vomit, white.
10. Had he had pains in the stomach, yes.
11. Had he been constipated, no.
12. If so, how long, —
13. Had he had diarrhœa, yes.
14. If so, how many times a day, 3 times.
15. In the house or outside, outside.
16. What was the colour of the motion, white.
17. Was there any blood in the motion, no.
18. Had any one else in the house suffered from a similar complaint, no.
19. If so what is the name, —
20. Where do they get their water, from a well.
21. Has the house been disinfected, yes.
22. Have you put permanganate in the well, yes.
23. Did he suffer from cough, no.
24. Did he spit blood, no.
25. Informant, Hanzima bin Cubo.
26. REMARKS:—

The deceased was attacked with cholera yesterday and died at about 9 p.m. same day".

*(4). Prognosis.*—This in many cases was almost more difficult than the diagnosis. It is no confession of ignorance to admit, that many cases, which looked like recovery, died, and that here and there a case which appeared hopeless made an unexpected recovery.

*(5). Treatment.*—With the resources available, the injection of hypertonic salt solution was not practicable. It will be remembered, that in the first place the cholera hospital was more truly a "refuge" than a hospital in the real sense of the word; and then in the second place, the nursing was entirely unskilled, though it lacked nothing in patience, attention and devotion to the sick. Great use was made of pills of permanganate of potash with a suitable coating of keratin. The practice was to give 2 grains every quarter of an hour for two hours, then 2 grains every hour for the next 24 hours. Eventually permanganate of potash pills became *the* stand by of the medical staff. Practically no use was made of vaccine therapy. In the first place, no vaccine was available when the outbreak occurred, and it would have taken probably a month before any could be obtained. Any project of a widespread protective vaccination I considered impracticable, because in order to produce immunity two inoculations are necessary, at all events

with the B. & W. Vaccine. Dr. Carment on the arrival of a stock made use of a certain small amount in the Chwaka District, but no lessons can be drawn from the experiment other than the fact, that no native ever appeared for his second dose. It would seem that unless a cholera vaccine can be prepared of such a nature whereby an immunity is reached after one inoculation, its wide use among natives is made difficult.

No patient was discharged from hospital until his stools were found to be free from the v. choleræ, not only in smears, but after culture. The longest period in which it was found that vibrios persisted was 21 days. In this respect our experience differs from that of the workers in Manilla.

*(6). Notification.*—Weekly bulletins were published in the Official *Gazette*. The attached form was used for this purpose, as also for the daily notification to the Government.

“Return Showing Cases of Cholera for 24 hours ending 3 p.m.

| | District in which new cases have occurred. | No. | Deaths. | Local areas declared infected. | Date. | Date declared free. |
|---|---|---|---|---|---|---|
| New cases during 24 hours ... | | | | | | |
| Deaths during 24 hours ... | | | | | | |
| Discharged during 24 hours ... | | | | | | |
| Total deaths up to date ... | | | | | | |
| Total discharged up to date ... | | | | | | |
| Total remaining under treatment ... | | | | | | |
| Total cases up to date ... | | | | | | |

In all new cases all precautions of disinfection and isolation of contacts have been taken.

No cases having occurred outside the infected areas the port of Zanzibar remains free from cholera and clean bills of health are being issued ”.

*(7) Bacteriological Characters.*—In a typical “rice-water” stool sent from a patient in the Government Hospital, numbers of comma-shaped bacilli were seen on microscopical examination. They were motile and gram-negative.

Peptone salt inoculated with one of the small white flakes examined after 8 hours showed a number of comma-shaped bacilli present in a drop taken from the surface of the culture. It showed however great contamination. Agar and McConkey plates were inoculated by taking two loopfuls of the first peptone salt culture, and a second peptone salt tube was inoculated. One loopful from this was placed at the edge of an agar plate and smeared in a line over the centre by means of a glass rod. Two other plates were inoculated by drawing the glass rod, without recharging, in a line over the surface. The colonies on these plates were examined after 16 hours. One on the third plate was a colony of comma-shaped bacilli. From this colony, three more plates were inoculated by the methods described above. After 12 hours, on the third plate two colonies of comma-shaped bacilli in pure culture were obtained. On microscopical examination they were identical with the bacilli seen in a flake from the rice-water stool. They stained readily with weak carbol fuchsin and lost their stain when stained by Gram. They were motile and moved in a cork-screw fashion over the field. They agglutinated in half an hour in a dilution of 1/5000 anti-cholera serum. Normal blood serum 1/50 failed to agglutinate them after several hours, as also did normal saline.

The cultural reactions were as follows :—

| Gram | Motility | Saccharose | Lactose | Glucose | Mannite | Litmus milk | Indol | Peptone water |
|---|---|---|---|---|---|---|---|---|
| Negative | + | Acid | Acid slight | Acid | Acid slight | Acid | + | General turbidity and pellicle |

*(8) Staff.*—The staff engaged on cholera work under the direction of the Medical Officer of Health consisted of:—

### (i) Executive Staff.

| | |
|---|---|
| Qualified medical men ... | 4 |
| Bacteriologist ... | 1 |
| Chief Inspector ... | 1 |
| Sub-Inspectors ... | 12 |
| Hospital Assistants ... | 2 |
| Dispenser ... | 1 |
| Death Inspector ... | 1 |
| Special gang head-man ... | 1 |
| Special gang boys ... | 29 |
| Specially engaged disinfectors ... | 45 |
| Death reporters ... | 5 |
| Sub-Assistant Surgeon in charge of Gulioni Infectious Hospital ... | 1 |
| Ward boys ... | 13 |
| Milk-Depot overseers ... | 3 |
| " " boys ... | 3 |
| Office clerks ... | 2 |

### (ii) Transport Staff.

| | |
|---|---|
| Drivers in charge special motor cars ... | 2 |
| Total... | 126 |

### (iii) Distribution.

#### *(a) Town.*

In medical charge of the Town and suburbs, Dr. Freitas, who had under him :—

| | |
|---|---|
| Inspector of the dead ... | 1 |
| Sub-Inspectors ... | 3 |
| Special gang boys ... | 14 |

*Routine.*—The inspector reported to Dr. Freitas all cases of deaths in Town, Ngambo or suburbs which might be in the least degree suspicious of cholera. Dr. Freitas was available day and night for this duty as he was not liable to be called away.

*Gulioni Infectious Hospital.*—Sub-Assistant Surgeon, Mr. Durgadas Soni :—

| | |
|---|---|
| Ward boys ... | 12 |

#### *(b) Mkokotoni District.*

In medical charge, Dr. A. G. Carment, Assistant Medical Officer of Health, who had under him :—

| | |
|---|---|
| Sub-Inspectors ... | 3 |
| Special gang-men ... | 4 |
| Disinfectors ... | 6 |

*Routine.*—The work was divided up among sections of disinfectors—each section was in charge of a "special gang-man" and every two sections were directed by a Sub-Inspector.

Dr. Carment resided at Mkokotoni and exercised personal direction over the campaign.

Two huts were erected, one for sick and the other for contacts.

#### *(c) Chwaka District.*

In medical charge, Dr. J. S. de Sousa, lent by the Medical Department, who had under him :—

| | |
|---|---|
| Dispenser, Mr. Solomon of the Medical Department who co-operated. | |
| Sub-Inspector ... | 1 |
| Special gang-men ... | 6 |
| Disinfectors ... | 2 |

*Routine.*—Dr. J. S. de Sousa was fully occupied travelling along the coast. Mr. Solomon, who knew the village very well, practically made a daily house to house visit and supervised the disinfection of the wells.

The sub-inspector's duty was largely to watch the North Eastern Coast, and disinfect the wells, etc. of those villages he could get to.

A small Field Hospital was organised with three houses, one for sick and the others for contacts. Six cases could be accommodated and any large number of contacts.

### *(d) Mwera District.*

In medical charge the Medical Officer of Health, who had under him :—

| | |
|---|---|
| Chief Inspector, Mr. F. de Souza. | |
| Sub-Inspectors ... | 4 |
| Special gang-men ... | 6 |
| Special gang head-man ... | 1 |
| Disinfectors ... | 37 |
| Death reporters ... | 5 |

*Routine.*—Mr. de Souza directed the operations of the sections, each of which was under a special gang-man. Sections were grouped and were under the charge of a sub-Inspector. There was thus no overlapping of work and a large area of country was dealt with daily.

Over 3,000 houses in this District were visited and disinfected.

During the morning one of the sub-inspectors remained at the Collectorate in charge of the Field Dispensary.

Large quantities of sulphuric acid mixture were distributed daily.

One motor car was available to bring in any sick that might be found and a second one for enabling a staff to be rapidly concentrated at a point on any of the roads.

## Cholera Epidemic—Daily Incidence by Districts, Month by Month.

| Date | Town Districts and Quarantine Island | | | | | N'gambo District | | | | | Mwera District | | | | | Mkokotoni District | | | | | Chwaka District | | | | | Total for 5 months | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | August | September | October | November | Decemer | August | September | October | November | December | August | September | October | November | December | August | September | October | November | December | August | Setember | October | November | December | August | September | October | November | December | |
| 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 4 | 1 | ... | ... | ... | 11 | ... | ... | ... | ... | 48 | 15 | ... | ... | ... | 63 | 16 | 79 |
| 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | 2 | 4 | ... | ... | ... | ... | 9 | 3 | ... | ... | ... | ... | 6 | ... | 2 | 2 | 13 | 9 | 26 |
| 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | ... | 1 | ... | ... | ... | ... | 7 | ... | ... | ... | ... | 19 | 13 | ... | 2 | ... | 27 | 13 | 42 |
| 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | ... | 4 | ... | ... | ... | ... | 10 | ... | ... | ... | 1 | 6 | 2 | ... | 2 | 1 | 20 | 2 | 25 |
| 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | ... | 5 | ... | ... | ... | ... | 11 | ... | ... | ... | ... | 5 | 2 | ... | 3 | ... | 21 | 2 | 26 |
| 6 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 5 | 2 | ... | ... | ... | ... | 4 | ... | ... | ... | ... | 2 | 8 | ... | ... | 5 | 8 | 8 | 21 |
| 7 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | 1 | ... | ... | ... | ... | 1 | ... | ... | ... | ... | 21 | 7 | 3 | ... | 2 | 23 | 7 | 35 |
| 8 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 6 | 1 | ... | ... | ... | ... | 4 | ... | ... | ... | ... | 6 | 6 | 2 | ... | 6 | 11 | 6 | 25 |
| 9 | 17 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | 2 | ... | ... | ... | ... | 10 | ... | ... | ... | ... | 15 | 4 | 17 | ... | 1 | 27 | 4 | 49 |
| 10 | 9 | ... | ... | ... | ... | 1 | ... | ... | ... | ... | 2 | ... | 7 | ... | ... | ... | ... | ... | 2 | ... | ... | ... | 1 | 23 | 6 | 12 | ... | 8 | 25 | 6 | 51 |
| 12 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 4 | 1 | ... | ... | ... | ... | 5 | ... | ... | ... | ... | 2 | 2 | 2 | ... | 4 | 8 | 2 | 16 |
| 12 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 3 | 3 | ... | ... | ... | ... | 2 | ... | ... | ... | ... | 9 | 5 | 3 | ... | 3 | 14 | 5 | 25 |
| 13 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 4 | 1 | ... | ... | ... | ... | 8 | ... | ... | ... | ... | 6 | 8 | 1 | ... | 4 | 15 | 8 | 28 |
| 14 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 14 | 1 | ... | ... | 2 | 14 | 1 | 17 |
| 15 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7 | 2 | ... | ... | ... | ... | 4 | ... | ... | ... | ... | 9 | 4 | 2 | ... | 7 | 15 | 4 | 28 |
| 16 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 4 | 3 | ... | ... | ... | ... | 9 | ... | ... | ... | ... | 10 | 1 | ... | ... | 4 | 22 | 1 | 27 |
| 17 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | 1 | 6 | ... | ... | ... | ... | ... | 1 | ... | ... | ... | 5 | 19 | 2 | 3 | 1 | 11 | 20 | 2 | 37 |
| 18 | 1 | ... | 1 | ... | ... | 2 | ... | ... | ... | ... | 3 | ... | 2 | 2 | ... | ... | ... | ... | 4 | ... | ... | ... | ... | 3 | ... | 6 | ... | 3 | 9 | ... | 18 |
| 19 | 2 | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | 3 | 1 | 2 | ... | ... | ... | 3 | ... | ... | ... | ... | 1 | 16 | ... | 2 | 3 | 6 | 18 | ... | 29 |
| 20 | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... | 1 | 2 | ... | ... | ... | 4 | ... | ... | ... | ... | ... | 13 | ... | ... | ... | 6 | 15 | ... | 21 |
| 21 | 1 | ... | ... | ... | ... | ... | ... | 1 | ... | ... | 1 | ... | 1 | 1 | ... | ... | ... | 17 | ... | ... | ... | ... | ... | 5 | ... | 2 | ... | 19 | 6 | ... | 27 |
| 22 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 5 | ... | 2 | 1 | ... | ... | ... | 5 | ... | ... | ... | ... | 2 | 2 | ... | 6 | ... | 9 | 3 | ... | 18 |
| 23 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | 1 | ... | ... | ... | 12 | 1 | ... | ... | ... | .. | 10 | 1 | ... | ... | 14 | 12 | 1 | 27 |
| 24 | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | 2 | ... | ... | 2 | ... | ... | ... | 6 | ... | ... | ... | ... | ... | 8 | ... | 2 | ... | 7 | 10 | ... | 19 |
| 25 | ... | ... | ... | ... | ... | ... | ... | 3 | ... | ... | 1 | ... | 6 | 2 | ... | ... | ... | 6 | 7 | ... | ... | ... | 3 | 8 | ... | 1 | ... | 18 | 17 | ... | 36 |
| 26 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | 3 | ... | ... | ... | 10 | ... | ... | ... | ... | 1 | 6 | ... | ... | ... | 14 | 9 | ... | 23 |
| 27 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | 3 | 1 | ... | ... | ... | 13 | 2 | ... | ... | ... | 1 | 9 | ... | ... | 1 | 17 | 12 | ... | 30 |
| 28 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 5 | ... | 2 | ... | ... | ... | ... | 11 | 4 | ... | ... | ... | ... | 7 | ... | 5 | ... | 13 | 11 | ... | 29 |
| 29 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | 3 | ... | ... | ... | 17 | 4 | ... | ... | ... | 10 | 12 | ... | 1 | ... | 30 | 19 | ... | 50 |
| 30 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 2 | 2 | ... | ... | ... | 10 | ... | ... | ... | ... | ... | 9 | ... | 1 | ... | 12 | 11 | ... | 24 |
| 31 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 4 | ... | 4 | ... | ... | ... | ... | 14 | ... | ... | ... | ... | 3 | ... | ... | 4 | ... | 19 | ... | ... | 23 |
| Total | 42 | ... | 1 | ... | ... | 3 | ... | 7 | ... | ... | 30 | 14 | 85 | 56 | 1 | ... | ... | 126 | 120 | 3 | ... | ... | 28 | 322 | 93 | 75 | 14 | 247 | 498 | 97 | 931 |

## *Cholera Epidemic in Chwaka District, 1912.*

### OCTOBER.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chwaka ... | | | | | | | | | | 1 | | | | | | | 2 | | 1 | | | | | | | 1 | | | 4 | | 1 | 10 |
| Bweju ... | | | | 1 | | | | | | | | | | | | | | | | | | 2 | | | 3 | | 1 | | 6 | | 2 | 15 |
| Paji ... | | | | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | 3 |
| Total ... | | | | 1 | | | | | | 1 | | | | | | | 5 | | 1 | | | 2 | | | 3 | 1 | 1 | | 10 | | 3 | 28 |

### NOVEMBER.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chwaka ... | 3 | | 4 | | | | 2 | | 1 | 2 | | 2 | 2 | | 1 | | | | | | 1 | | | | | | | | | | | 18 |
| Bweju ... | 2 | | 4 | | | | 4 | 3 | 2 | 4 | | 4 | | 6 | 2 | 5 | 7 | 1 | 7 | 5 | 3 | | 4 | 1 | | 1 | 2 | 1 | | | | 68 |
| Mkunduchi ... | 2 | | | | | | 1 | | 2 | | | | | | | | | | | | | 1 | | | | | | | | 1 | | 7 |
| Mdudu Mkubwa ... | 36 | | 7 | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 44 |
| Ukongoroni ... | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Pongwe ... | 4 | | | 4 | | | 11 | 1 | 6 | 10 | 2 | | 2 | 4 | | 1 | 2 | 1 | | | | | | | | | | | | | | 48 |
| Urua ... | | | 3 | 1 | | | 2 | | 3 | 2 | | | | 3 | 3 | 3 | 1 | 1 | | | | | | | | | | | | | | 22 |
| Kimu ... | | | | | 3 | | 1 | | | 4 | | 1 | | | | | | | | | | | | | | | | | | | | 9 |
| Mbuji ... | | | 1 | | | | | 2 | | | | | 2 | | | | | | | | | | | | | | | | | | | 5 |
| Mfumbwa Mkanjani | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Nyambiza ... | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| Jambiani ... | | | | | | | | | | | | | | 1 | 3 | 1 | 1 | | 5 | 5 | | 1 | 5 | 4 | 5 | 3 | 5 | 6 | 9 | 6 | | 60 |
| Cheju ... | | | | | | | | | | | | | | | | | 1 | | | | | | | | | 1 | | | | | | 2 |
| Charawe ... | | | | | | | | | | | | | | | | | 7 | | 4 | | | | | | | | | | | | | 11 |
| Ndijani ... | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | 2 |
| Umbuji ... | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| Shebahadji ... | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | 1 |
| Mzumbwe ... | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | 1 |
| Mchambwe ... | | | | 1 | 2 | | | | | | | | | | | | | | | 1 | | | 1 | | | 1 | 2 | | | | | 8 |
| Paji ... | | | | | | | | | 1 | | | 1 | | | | | | | | | | | | 3 | 1 | | | | 3 | 2 | | 11 |
| Total ... | 48 | | 19 | 6 | 5 | 2 | 21 | 6 | 15 | 23 | 2 | 9 | 6 | 14 | 9 | 10 | 19 | 3 | 16 | 13 | 5 | 2 | 10 | 8 | 8 | 6 | 9 | 7 | 12 | 9 | | 322 |

### DECEMBER.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jambiani ... | 15 | 4 | 13 | 1 | 1 | 7 | 4 | 3 | 2 | 1 | 1 | 5 | 8 | | | | | | | | | | | | | | | | | | | 65 |
| Cheju ... | | 1 | | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | | 4 |
| Mchambwe ... | | | | 1 | | | | | | 1 | | | | | | 1 | 1 | | | | | | 1 | | | | | | | | | 5 |
| Bweju ... | | | | | | | 2 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Paji ... | | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 1 | 4 | | 1 | | | | | | | | | | | | | | | 14 |
| Pagali (Jambiani) ... | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Total ... | 15 | 6 | 13 | 2 | 2 | 8 | 7 | 6 | 4 | 6 | 2 | 5 | 8 | 1 | 4 | 1 | 2 | | | | | | 1 | | | | | | | | | 93 |

## *Cholera Epidemic in Town, 1912.*

### AUGUST.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Government Hospital | | | | | | | 3 | 1 | 12 | 3 | | | | | | | | | | | | | | | | | | | | | | 19 |
| Native Jail ... | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | 5 |
| Quarantine Island ... | | | | | | | | | | 6 | 1 | 2 | 1 | | 2 | | | 1 | 2 | | 1 | | | | | | | | 1 | | | 17 |
| Mwembe Ladu ... | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 * |
| Miafuni ... | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 1 * |
| Kisimajungo ... | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 1 * |
| Malindi ... | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | 1 † |
| Total ... | | | | | | | 3 | 1 | 17 | 10 | 1 | 2 | 1 | | 2 | | | 3 | 2 | | 1 | 1 | | | | | | | 1 | | | 45 |

* Ngambo.
† Town.

## OCTOBER.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Government Hospital | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Native Jail | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quarantine Island | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mwembe Ladu | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | 1 |
| Miafuni | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | 1 * |
| Kisimajongo | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Malindi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kidutani | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 1 † |
| Mechenzani | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | 1 ⎫ |
| Kohema | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 ⎬ * |
| Kikwajuni | | | | | | | | | | | | | | | | | | | | | | | 1 | 2 | | | | | | | | 3 ⎭ |
| Total | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | | 1 | 3 | | | | | | | | 8 |

* Ngambo
† Town

## *Cholera Epidemic in Mwera District, 1912.*

### AUGUST.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fuoni and Changa<br>Fuoni | | | | | | | | 1 | | 2 | 1 | 1 | | | | | 3 | 2 | | | | | | | | | | | | | | 10 |
| Kibonde Mzungu | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 4 | | | 2 | 8 |
| Mwera | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 2 | 3 |
| Walezo P. House | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | 1 | | | 1 | | | | 4 |
| Mtoni | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 1 |
| Bububu | | | | | | | | | | | | | | | | | | | | | | 4 | | | | | | | | | | 4 |
| Total | | | | | | | | 1 | | 2 | 1 | 1 | | | | | 3 | 3 | | | 1 | 5 | | 2 | 1 | | | 5 | | 1 | 4 | 30 |

### SEPTEMBER.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kibonde Mzungu | | 2 | 1 | 2 | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | 6 |
| Mwera | | | 1 | | 3 | | | | | | | | | | | | 1 | | 1 | | | | | | | | 1 | | | | | 7 |
| Mwera Brikani | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | 1 |
| Total | | 2 | 2 | 2 | 3 | | | | | | | | | | | | 1 | | 3 | | | | | | | | 1 | | | | | 14 |

### OCTOBER.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fuoni | | 1 | | | | 1 | | | 1 | | | | | 1 | | 1 | | | | | | 1 | | | | | | | | | | 6 |
| K. Mzungu | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mwera | | 1 | | | | | | 4 | | 3 | 1 | 1 | 1 | | 1 | 2 | 2 | | | | | | | | 1 | | | 1 | 1 | | | 19 |
| Mtoni | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | 1 |
| Kuani | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Dunga | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Kinuni | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Kianga | | | | | | 1 | 2 | 2 | | 1 | 2 | | 2 | | | | | 2 | | | | | 1 | | | | 1 | | | | | 14 |
| Bungi | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| M. Mchangani | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| Pongwe | | | | | | | | | | | 1 | | | | | | 1 | | | | | | | | | | | | | | | 2 |
| Zumburi | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| Walezo | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| Kimara | | | | | | | | | | | | | 1 | 1 | 1 | | | | 1 | 1 | | | | | | | | | | | | 5 |
| Machui | | | | | | | | | | | | | | | 1 | | | | | | | 1 | | | 4 | 2 | 1 | | 1 | | 2 | 12 |
| Jumbi | | | | | | | | | | | | | | | 1 | | | | | | | | 1 | | | | | | | | 1 | 3 |
| Chumbuni | | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | 3 |
| Makdine | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 | | | | | 2 |
| Miwanzini | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | 1 |
| M. Misufini | | | | | | | | | | | | | | | | | 2 | | | | | | | | | 1 | | | 1 | | 1 | 5 |
| Mdo | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| Kipanga | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | 1 |
| Bambi | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 |
| Bweni | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | 1 |
| Total | | 2 | | | | 5 | 2 | 6 | 1 | 7 | 4 | 3 | 4 | 2 | 7 | 4 | 6 | 2 | 1 | 1 | 1 | 2 | 2 | | 6 | 3 | 3 | 2 | 3 | 2 | 4 | 85 |

## NOVEMBER.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M. Kiniasini | ... | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Bambi | ... | 1 | 1 | | 1 | | | | 1 | | | | | | | | 1 | | 1 | | | | | | | 1 | | | | | | | 7 |
| Kinuni | ... | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Bebekani | ... | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Machui | ... | | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Mwera | ... | | 2 | | 1 | | | | | | | | | | | | | | | | 1 | | | | | | | 1 | | | | | 5 |
| Keongoni | ... | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mchangani | ... | | | | 1 | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | 3 |
| Uzini | ... | | | | | 4 | 2 | | | | 2 | | | | | | | | | | | | | 1 | | | 1 | | | | | | 10 |
| Fuoni | ... | | | | | | | | | | | | | | | | 1 | | 1 | | | | | | | | | | | | 1 | | 3 |
| Mkuku | ... | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mezingani | ... | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Kianga | ... | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 | | 1 | | 3 |
| Pagali | ... | | | | | | | | | 1 | | | | | | | 1 | | | | | | | | | | | | | | | | 2 |
| Misufini | ... | | | | | | | | | | | 1 | | | | | | | | 1 | | | | | | | 1 | | | | | | 3 |
| Tunduni | ... | | | | | | | | | | | | | 1 | | | | | | 1 | | | | | | 1 | | | | | | | 3 |
| Bumbwi | ... | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | 1 |
| M. Haji | ... | | | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | | | | | 2 |
| Kimara | ... | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | | 2 |
| Kiboje | ... | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | 2 |
| Kisima Mchaga | ... | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 |
| Walezo | ... | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 |
| Total | ... | 4 | 4 | 1 | 4 | 5 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | | 2 | 3 | | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 3 | | 2 | | 56 |

## DECEMBER.

| | | | | |
|---|---|---|---|---|
| Buzini | ... | 1 | Total ... | 1 |

### *Table showing Sexes and Ages of the Cholera Cases in Zanzibar Island.*

### SEX.

| | | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|---|
| Males | ... | 58 | 7 | 87 | 236 | 33 | 421 |
| Females | ... | 14 | 7 | 92 | 261 | 64 | 438 |
| Unknown sex | ... | 3 | .. | 68 | 1 | ... | 72 |
| Total | ... | 75 | 14 | 247 | 498 | 97 | 931 |

### AGES.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 to 5 years | ... | 1 | ... | 6 | 19 | 9 | 35 |
| 5 ,, 10 ,, | ... | ... | ... | 2 | 19 | 1 | 22 |
| 10 ,, 20 ,, | ... | 8 | 2 | 12 | 19 | 4 | 45 |
| 20 ,, 30 ,, | ... | 22 | 6 | 43 | 90 | 15 | 176 |
| 30 ,, 40 ,, | ... | 26 | 3 | 45 | 91 | 21 | 186 |
| 40 ,, 50 ,, | ... | 3 | 3 | 30 | 64 | 10 | 110 |
| 50 ,, 60 ,, | ... | ... | ... | 18 | 32 | 14 | 64 |
| 60 ,, 70 ,, | ... | 1 | ... | 10 | 20 | 6 | 37 |
| 70 ,, 80 ,, | ... | 1 | ... | 8 | 14 | 6 | 29 |
| Over 80 | ... | ... | ... | 3 | 28 | 11 | 42 |
| Unknown age | ... | 13 | ... | 70 | 102 | ... | 185 |
| Total | ... | 75 | 14 | 247 | 498 | 97 | 931 |

## *Town, N'gambo and Poison Island Cholera Cases—Statement showing Sex and Ages.*

### Sex.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| Males ... | 44 | ... | 4 | ... | ... | 48 |
| Females ... | 1 | ... | 4 | ... | ... | 5 |
| Total ... | 45 | ... | 8 | ... | ... | 53 |

### Ages.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| 10 to 20 years ... | 6 | ... | | ... | ... | 6 |
| 20 ,, 30 ,, ... | 19 | ... | 4 | ... | ... | 23 |
| 30 ,, 40 ,, ... | 18 | ... | 4 | ... | ... | 22 |
| 40 ,, 50 ,, ... | 2 | ... | | ... | ... | 2 |
| Total ... | 45 | ... | 8 | ... | ... | 53 |

## *Mwera District Cholera deaths—Statement showing Sex and Ages.*

### Sex.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| Males ... | 14 | 7 | 42 | 28 | ... | 91 |
| Females ... | 13 | 7 | 40 | 28 | 1 | 89 |
| Unknown ... | 3 | ... | 3 | ... | ... | 6 |
| Total ... | 30 | 14 | 85 | 56 | 1 | 186 |

### Ages.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| 1 to 5 years ... | 1 | ... | ... | 1 | ... | 2 |
| 5 ,, 10 ,, ... | ... | ... | ... | 2 | ... | 2 |
| 10 ,, 20 ,, ... | 2 | 2 | 3 | 2 | ... | 9 |
| 20 ,, 30 ,, ... | 3 | 6 | 18 | 11 | ... | 38 |
| 30 ,, 40 ,, ... | 8 | 3 | 25 | 19 | ... | 55 |
| 40 ,, 50 ,, ... | 1 | 3 | 17 | 16 | ... | 37 |
| 50 ,, 60 ,, ... | ... | ... | 9 | 2 | ... | 11 |
| 60 ,, 70 ,, ... | 1 | ... | 7 | 2 | ... | 10 |
| 70 ,, 80 ,, ... | 1 | ... | 1 | ... | 1 | 3 |
| 80 ,, 90 ,, ... | ... | ... | ... | 1 | ... | 1 |
| Unknown ... | 13 | ... | 5 | ... | ... | 18 |
| Total ... | 30 | 14 | 85 | 56 | 1 | 186 |

## *Mkokotoni District Cholera deaths—Statement showing Sex and Ages.*

### Sex.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| Males ... | ... | ... | 27 | 58 | 2 | 87 |
| Females ... | ... | ... | 34 | 62 | 1 | 97 |
| Unknown ... | ... | ... | 65 | ... | ... | 65 |
| Total ... | ... | ... | 126 | 120 | 3 | 249 |

### Ages.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| 1 to 5 years ... | ... | ... | 6 | 9 | ... | 15 |
| 5 ,, 10 ,, ... | ... | ... | 2 | 2 | ... | 4 |
| 10 ,, 20 ,, ... | ... | ... | 8 | 6 | 2 | 16 |
| 20 ,, 30 ,, ... | ... | ... | 11 | 34 | ... | 45 |
| 30 ,, 40 ,, ... | ... | ... | 13 | 24 | ... | 37 |
| 40 ,, 50 ,, ... | ... | ... | 7 | 20 | ... | 27 |
| 50 ,, 60 ,, ... | ... | ... | 5 | 11 | 1 | 17 |
| 60 ,, 70 ,, ... | ... | ... | 3 | 7 | ... | 10 |
| 70 ,, 80 ,, ... | ... | ... | 4 | 4 | ... | 8 |
| Over 80 ... | ... | ... | 3 | 2 | ... | 5 |
| Unknown age ... | ... | ... | 64 | 1 | ... | 65 |
| Total ... | ... | ... | 126 | 120 | 3 | 249 |

## *Chwaka District Cholera deaths—Statement showing Sex and Ages.*

### SEX.

| | August | September | October | November | December | Total. |
|---|---|---|---|---|---|---|
| Males ... | ... | ... | 14 | 150 | 31 | 195 |
| Females ... | ... | ... | 14 | 171 | 62 | 247 |
| Unknown sex ... | ... | ... | ... | 1 | ... | 1 |
| Total ... | ... | ... | 28 | 322 | 93 | 443 |

### AGES.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 to 5 years ... | ... | ... | ... | 9 | 9 | 18 |
| 5 „ 10 „ ... | ... | ... | ... | 15 | 1 | 16 |
| 10 „ 20 „ ... | ... | ... | 1 | 11 | 2 | 14 |
| 20 „ 30 „ ... | ... | ... | 10 | 45 | 15 | 70 |
| 30 „ 40 „ ... | ... | ... | 3 | 48 | 21 | 72 |
| 40 „ 50 „ ... | ... | ... | 6 | 28 | 10 | 44 |
| 50 „ 60 „ ... | ... | ... | 4 | 19 | 13 | 36 |
| 60 „ 70 „ ... | ... | ... | ... | 11 | 6 | 17 |
| 70 „ 80 „ ... | ... | ... | 3 | 10 | 5 | 18 |
| Over 80 ... | ... | ... | ... | 25 | 11 | 36 |
| Unknown age ... | ... | ... | 1 | 101 | ... | 102 |
| Total ... | ... | ... | 28 | 322 | 93 | 443 |